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San Francisco, Calif.

February 15, 1926
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Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

Frigidaire

offers to Public Utility Companies the Assistance of a Nation-Wide Field Organization

THE public utility company selling Frigidaire finds a nation-wide field organization ready to help it in the building up of its own refrigeration sales organization.

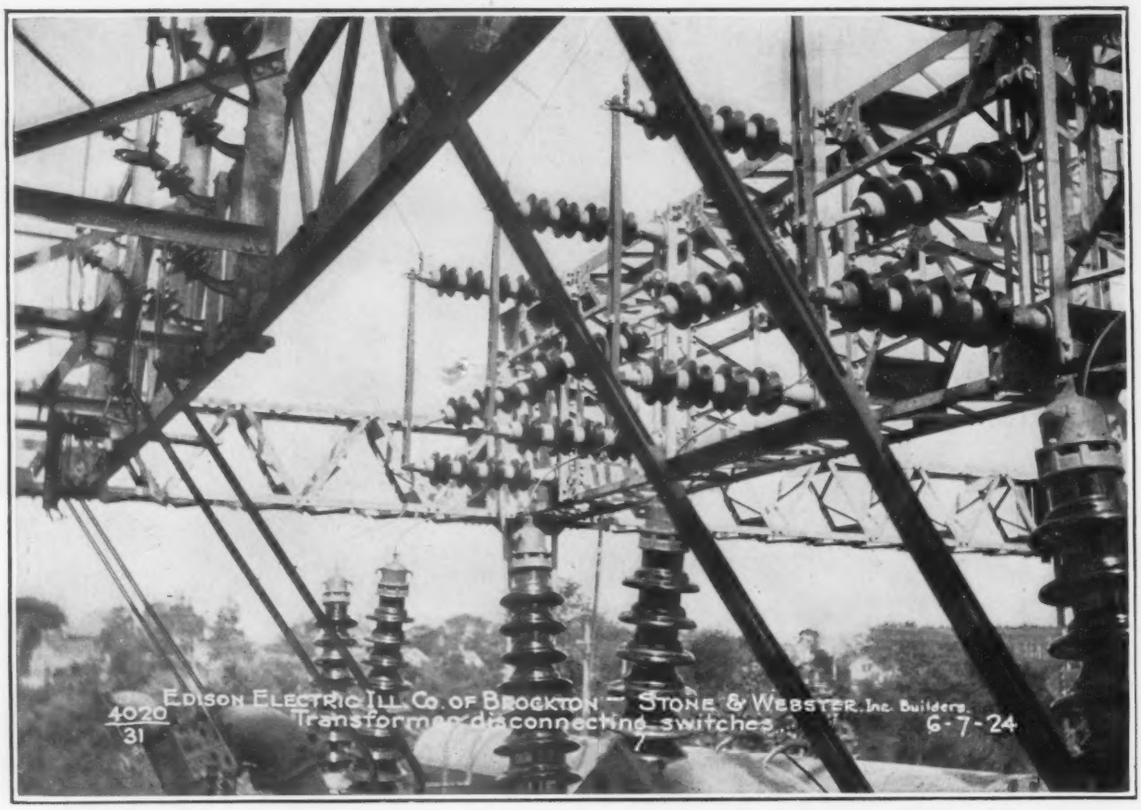
In the principal cities of the country there are Frigidaire supervisory headquarters which are prepared to assist the public utility company in training its salesmen and servicemen—which can supply special salesmen for the handling of special types of sales—which carry a complete stock of Frigidaire models and Frigidaire service parts, always available to the public utility company—which are prepared to assist in service and installation work whenever necessary. The assistance of these supervisory headquarters means that the public utility company which undertakes the sale of Frigidaire steps immediately into a business that is thoroughly organized—capable of producing immediately a large volume of sales and a large volume of profit.

Write today for the complete information as to how the Frigidaire organization can serve you.

Frigidaire
ELECTRIC REFRIGERATION

DELCO-LIGHT COMPANY, DAYTON, OHIO
Subsidiary of General Motors Corporation

The World's Largest Makers of Electric Refrigerators



How do you operate your disconnects

—*on high voltage stations?*

You wouldn't want to go back to handcranking your automobile. The inconvenience and hazard are too great.

Then why expose your men to the *hazard* of hand operated disconnects—and to the *haphazard* result to line and life.

Here is the accepted method:

1. Remote control operation of disconnects.
2. Group operation of disconnects.

This provides convenience and safety, giving you means for putting the disconnects up out of the way and for space saving on structures.

Another case of the economy of mechanical certainty vs. the cost of human frailty.

for the good of the Service

ELPEC

ELECTRIC POWER EQUIPMENT CORPORATION

412-420 NORTH EIGHTEENTH ST. PHILADELPHIA, PA.

Western Representatives: C. E. INGALLS, Rialto Bldg., San Francisco, Cal.; EICHER & BRATT, 570 Colman Bldg., Seattle, Wash.

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IN THE ELEVEN WESTERN STATES

A McGraw-Hill Publication

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Proof

IF "proof of the pudding is in the eating," then the experience of one large electrical manufacturer during the past eight years offers mute testimony to the soundness of the McGraw-Hill Four Principles of Industrial Marketing. On pages 30 and 31 of this issue is reproduced the eighth of a series of advertisements prepared by the McGraw-Hill Company to arouse a national recognition of the need for improving industrial sales efficiency, and to awaken a keener interest in the correct principles of industrial selling. In this advertisement the experiences of this particular manufacturer are cited to show how, despite shifting markets and constant changes in equipment, sales steadily mounted because:

1. The manufacturer analyzed each market and accurately appraised its sales possibilities. (Market Determination).

2. Contact was established with the men who came closest to the problems involving the use of this manufacturer's products. Buying habits were studied. (Buying Habits).

3. Sales promotion efforts were directed toward the proper persons through a balanced program involving publicity, manufacturer's literature, special sales work and exhibits. (Channels of Approach).

4. Advertisements and literature were changed from mere descriptions of products and made a source of helpful information. (Appeals that Influence).

These same principles may be applied to any selling problem. The McGraw-Hill staff of Marketing Counselors is available to any manufacturer. Its counsel is offered freely in the interests of efficient selling to industry.

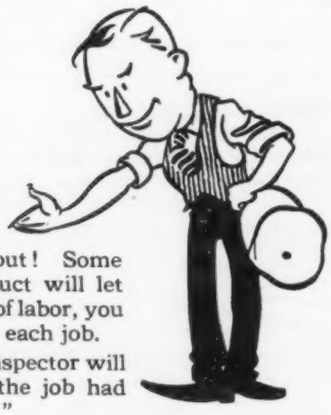
Labor cost is the big question in wiring that old house

DURADUCT

Reg. U S. Pat. Off.

will cut labor costs because the single wall and the *roller bearing wireway* make faster fishing. — It's one of the

DURABILT PRODUCTS



Well, the secret has finally leaked out! Some wise feller has discovered that if Duraduct will let you do the same work with less hours of labor, you are in danger of makin' more money on each job.

Mr. Jobber, Mr. Contractor, and Mr. Inspector will now sing that sweet refrain, "We saw the job had Duraduct——we *know* you're satisfied."

Dura Bill

TUBULAR WOVEN FABRIC COMPANY :: PAWTUCKET, R. I.

EDITORIAL

The Mutualization of the Public Utility

FROM the brain of a Western power company executive and the pen of a Western financial writer has come a thought with which utility-finance men may conjure, perhaps with profit. The thought deals with the coined expression, "service dividends." The plan involves the distribution of earnings above the return allowed by public service commissions among the consumers, the management-labor group and the stockholders of a public utility on a pro rata basis. The originators of the suggestion reason that, under such an incentive, these groups will put forth extraordinary efforts to extend the sale of electricity, appliances and stock, and to promote economy in operation and technical improvements through inventions. If increased earnings should result, the excess above the allowable return would be distributed, one-half to consumers and one-half to management-labor and stockholders.

To the consumers such a service dividend might mean the operation of a washing machine for a year without cost. To the workers and employees it would represent extra compensation for efficient work and to the stockholders it would amount to an extra dividend.

The idea, while new, insofar as utilities are concerned, has been tried successfully in other businesses, notably by life insurance companies. Mutual companies have existed for many years, and there are few companies which do not pay dividends to policy holders. All of us have had the pleasurable experience of receiving a notice from our insurance company at the end of the year that several dollars are available as a dividend on our policy—the money representing the saving between actual and estimated cost of doing business. Why should not the same procedure be applied to the utilities?

At some future time service dividends might become the easy and automatic means of adjusting electric and other public-utility rates between producer and consumer. There seems no good reason why a dividend check at the end of a year based upon the bills of a consumer might not be a quicker and more flexible means of giving to the consumer the benefits of reduced costs of service than a rate cut. From the standpoint of the stockholder-partner in a public-utility company a small portion of the savings produced by efficiency might be added to his dividend check as his portion of the profits arising from the economical conduct of the business in which he is an investor. Labor and management also might be the recipient of service dividends which would have a tendency to inspire economy and efficiency and somewhat offset the one effect of strict regulation—namely, penalizing efficiency.

At any rate the thought that service dividends might act as an equitable means of adjusting fluctuating conditions in rates, stock dividends and payrolls is a constructive one.

Emotion and Water Rights

SECRETARY Hoover, in speaking of the Colorado River situation not long ago, made this sage remark, "It took ten years to secure the ratification of the federal constitution, and I doubt if there was as much emotion connected with that ratification as there is in the matter of water rights."

Compared to the federal constitution, then, is the Colorado River to assume a place of importance far in excess of the fundamentals of American government? This seems an unnecessary magnification of a relatively unimportant matter, yet it is undoubtedly true. Perhaps this is because the constitution is a more or less abstract document, setting forth principles under which people shall be governed. With water rights, however, the question is one of immediate monetary or commercial importance, and hence valued in the immediate sense out of all proportion to its enduring worth.

It is extremely unfortunate that so utilitarian a development as might result from harnessing the Colorado River for flood control, irrigation and power generation cannot be accomplished without emotion. Emotion has no place in engineering, and this is purely an engineering job. To clothe it in the emotion with which it now seems swathed results only in endangering its engineering possibilities. Whatever finally is done about the Colorado River is bound to be unsatisfactory to someone. And it is more than likely that whatever is done will be colored by some emotional consideration or other that will have little or no regard for true engineering requirements.

Mixing emotion with concrete and steel always is expensive. Not infrequently it results in a weakened structure. Once the emotion has spent itself as it finally does, the engineering stands as a more or less scarred monument to some passing wave of feeling.

Unfortunate it is, then, that so much emotion surrounds the Colorado River situation. It will make so much farther off that day when the Imperial Valley may find safety from flood waters

and yet have adequate water for irrigation. It will delay that day when any of six or seven states may receive benefits from a river with great potentialities for useful work. It will, in truth, keep impotent one of the factors that will mean much to the development of the entire West.

Forty Per Cent of Domestic Consumers Are Electric Refrigerator Prospects

"FORTY per cent of the domestic consumers on the lines of our company are prospects for electric refrigerators." So speaks the chief executive of one of the largest central stations in the West. He continues, "This number of refrigerators will not be sold in a day or a year, but three or perhaps five years from now the majority of these homes will be getting their ice over the lines of our company." His conclusions are based upon the number of substantial citizens in the territory his company serves who own their homes and their automobiles; upon the fact that the use of ice in this territory is almost imperative for the preservation of food and foremost, upon the belief that the electric refrigerator is the greatest boon ever offered to the American housewife by the electrical industry, even including the washing machine, the vacuum cleaner and the electric range.

Whether or not the forty per cent which this company feels will apply in its case will hold for other companies, the fact remains that the electric refrigerator presents untold opportunities for the development of new and profitable business for the central station. If it offers the possibilities which this executive feels it does, it should find a place on the program of every power-company commercial department at least equal to the posion granted the electric range. It is our prediction that refrigerator sales next year will exceed range sales in the West where the electric range has its widest use. There is every reason to believe that in time electric refrigerators will replace the ice chest in every home now using ice.

There is no time like the present to begin the study and development of the domestic refrigeration load. Successful merchandising will come only from experience, and there can be no experience until a start is made.

Paying Customs to Yourself

CONTENDING that since magazines carry much advertising they should pay a duty in proportion to the amount of advertising they contain, a Canadian magazine believes that such a move on the part of the Canadian government would protect Canadian publications. It seems that advertising brought into Canada from the States must pay a duty of 15 cents a pound. And the Ontario Associated Boards of Trade and Chambers of Commerce, it appears, has asked that magazines imported should pay a similar duty.

The argument is based on a feeling that "advertising in American magazines creates a large Canadian demand for a variety of American-made goods." It is expressed further that a wide distribution of American magazines is not in the interests of Canadian nationalism. As a specific example an editorial in favor of Canadian export of hydroelectric power is cited in which, it was stated, the point of view was entirely in the interests of United States industry. This is called propaganda by the Canadian magazine.

No doubt there is much justification in the feelings expressed, especially from a Canadian point of view. And yet an import duty on magazines merely results in an added burden on the recipient of the magazine and is not particularly a deterrent to the publisher. The customer pays the duty, in other words, and whether the viewpoint of the magazine is Canadian or United States, if he wants the magazine for the information it contains, for the value it may have to his own activities, even for that opposite point of view, as well he may, it is hardly fair to charge him for the advertising the magazine contains.

It is true that American advertising creates a demand for American goods. That is what it is for. It may be possible that advertising in Canadian magazines which find some circulation in the United States creates an American demand for Canadian goods. That, too, is what advertising is for. Just because the advertising emanates from one side or another of an imaginary line cannot change its appeal materially.

An embargo on intelligence, however, is a serious matter. It cannot but impoverish in proportion to its effectiveness the nation which places the embargo upon itself. Whatever international commercial maladjustments may exist are of minor importance compared to the dissemination of useful and established facts about methods of work or procedure. It would be a blunder for Canadians or nationals of any other country to block the flow of ideas into their country. Whether they could use them or not, or would care to, should rest with local conditions and with individual discrimination.

Constructive Plan for Dealer Co-operation Devised by Jobber

CO-OPERATION with dealers is a subject that has been discussed by practically every jobber of electrical supplies, and many methods have been tried to bring about the desired result. One constructive plan that has been brought to our attention is described elsewhere in this issue. In an effort to bring about a better understanding of merchandising problems by electrical dealers, this particular jobber invites the dealers and their wives to a monthly meeting to discuss those problems. The meetings are non-commercial in nature and are intended to supply constructive suggestions a timely subject is discussed by a competent which will benefit the dealer. At each meeting speaker. The sponsoring of these meetings is a commendable move on the part of the jobber and others who are aiding in their success. It is an example of the work which is being done by various groups in the industry in an effort to keep the men who supply the public with electrical appliances abreast of the times.

Constructive vs. Destructive Appliance-Selling Arguments

SALESPEOPLE are tempted to use destructive sales arguments when business begins to tighten up. This practice causes people to "shop" from store to store and results in increased selling costs.

Consider the salesman talking with a woman prospect for a washing machine. She is interested, and her desire to own the machine is built up as he tells her the many advantages of doing the washing at home with an electric washing machine. He climaxes his sales talk by saying, "Our washing machines won't tear clothes!" Until that statement was made the woman did not think that any machine would tear clothes.

Immediately her interest subsides, and she becomes skeptical of all washing machines if the insinuation is true that some other washing machine will tear clothes. She wants to hear about some other machine and also check up the salesman's statements. She goes to several other stores and hears that the particular make of machine handled in each won't tear clothes. She feels someone is a liar and wants to go home and "think it over"—her desire to purchase on that particular day is killed. This "shopping tendency and wanting to "think it over" increase the cost of selling.

Salesmen should be instructed to use constructive selling arguments only. They should sell the idea of performing the operation electrically; that all standard appliances are good. They should not be allowed to vary from this policy.

A Publicity Job that Is Incomplete

THE knowledge that ignorance breeds suspicion and distrust is one of the fundamentals of good public relations. It has a direct and indisputable bearing upon the success of every electrical utility doing business today. Definite efforts are made by most of the progressive organizations to acquaint their customers in particular and the public in general with their financial structure, their business policies and their commercial activities. Sincere efforts are made to spread far and wide a general knowledge of the utility's business and to deal with the public squarely.

One important point has been overlooked, however, in these programs of publicity. The general public does not understand the difficult problems that face the engineering, construction and operating departments. It knows nothing of the weeks and months of study and research that attend many of the problems of these departments; it does not appreciate the vital nature of the work of the technical staff.

There is a way to combat this difficulty and that is for the electrical utilities to incorporate definitely in their advertising and publicity a continuous stream of information that will give the public at least a general idea of their technical activities. The dissemination of such authentic information should be a logical part of this program. To overlook it is to leave an unprotected flank.

DISCUSSION

Manufacturer Expresses Dislike for Congratulatory Advertising

To the Editor:

Sir—You have struck a very responsive chord in our advertising policy in your editorial on page 2 of the Jan. 1 issue of the Journal of Electricity.

We have long since definitely expressed ourselves as against the practice of congratulatory advertising.

S. S. SONDLES,
Manager Advertising Dept.
The Magnavox Company.

Oakland, Calif.
Feb. 1, 1926.

Electric Truck Distributor Sees Better Business for Future

To the Editor:

Sir—I was very much interested in your editorial in the Jan. 1 edition of the Journal of Electricity regarding the apparent sleeping sickness of the electric truck industry.

As I am the distributor in the Portland territory for the Commercial Truck Company I have a good opportunity to study conditions relative to the backwardness of the industry as reflected in this territory.

The paramount cause for the slowness of the electric truck business in this city seems to have sprung from some of the early trials by several concerns about ten years ago. Most of these trials eventually proved to be a failure which was due to several obvious reasons, the principal ones being inefficient trucks, many unpaved streets and a scattered population. These conditions have undergone a radical change and the present cannot be judged by the past.

The power companies of this city having observed these failures have been slow to get behind this business. However, this condition is changing and they are beginning to boost the electric truck industry, but there is much to be done yet before the transportation men of the West realize what the modern electric truck will do.

The electric truck manufacturers have been very conservative in their sales promotion in the past, but I anticipate a change in this policy in the near future, due to the increased demand for the electric truck. The greatest present need, according to my viewpoint, is more co-operation between the electric truck manufacturers and the power companies. This will undoubtedly put the electric truck in its right place and will effect a large saving to city transportation men.

HAL. E. COWGILL, Distributor,
Commercial Truck Company.

Portland, Ore.,
Jan. 18, 1926.

EXCHEQUER dam and power house of the Merced Irrigation District on the Merced River, Calif. The dam will be completed April 1, and the power house will be ready for operation about May 1. All valves, scroll cases and penstocks are now in place. The power house will have a capacity of 30,000 kw. and the reservoir 280,000 acre-ft.

Artificial Light

Its Accomplishments and Achievements*

WHAT the makers of artificial light have done with their medium is summed up in this comprehensive and yet simply stated lecture. It presents a record of achievement in illumination, and yet points to possibilities for future and more thorough application of artificial light to the various phases of human activity.

THERE is a group of men who deal with the fastest known element in existence—light—whose speed is 186,000 miles per second. It takes eight minutes and twenty seconds for the light of the sun to reach the earth, the sun being 93,000,000 miles away.

We marvel at the courage and daring of men who in airplanes have succeeded in attaining a speed of 300 miles per hour. If this could be kept up (and some day it undoubtedly will) it would take 18,600,000 minutes to cover the distance between the earth and the sun. Eighteen million six hundred thousand minutes is 310,000 hours, or thirty-six years.

Compare thirty-six years with eight minutes. Yet the group of men who are dealing with the eight-minute element are hardly known.

Lighting experts can send a beam of light twelve miles into the air instantly. The greatest altitude reached so far by airplane has been approximately seven miles and that has only been accomplished once.

We occasionally read a front-page headline something like this in effect, "Daring Aviators Plan Night Flying," then in smaller type (indicating secondary importance), "with the aid of powerful searchlights as beacons." And that's the point. "Powerful searchlights"—quicker than the flash of an eye—send beams of light, thousands of candlepower, **miles** into the air, and **controlled, absolutely controlled.** It is this which makes the art and science of artificial light most attractive and interesting, especially to its makers.

And it is of light control, or controlled light, we want to talk today.

Compare for a moment the mighty beams of searchlights used as beacons at sea for the protection of human lives, to the tiny light emitted from a lamp the size of a grain of wheat, used in a doctor's instrument. The following story clearly illustrates the point:

A few years ago a little boy somehow got a peanut lodged in his throat in such a way that unless it could be removed he would slowly choke to death. The child's father sent for the doctor at once, and for an hour and a half the physician worked over the lad's tiny throat. If he could not get the stubborn little particle out, the child would die. If in his efforts he pushed it ever so little in the wrong direction, the boy would choke at once. If at one instant the doctor's hand had faltered, or struck wrong, the child's fight would have been lost. And afterward when the boy's father gave the doctor a beautiful cigarette-case it wasn't with any sense of marking his gratitude; it was just a little remainder of something that he hoped the physician would never forget.

The doctor's skill saved the child's life. But not the doctor's skill alone. There was something else, without which all the skill in the world would have been helpless. There was one little thing, something hardly anyone would have noticed at all, except as a "matter of course," without which no power on earth could have saved the boy. In the darkness of the little throat the doctor must have light. He could see. The little boy's life depended upon and was saved by electric light.

And so on through the whole range of artificial light-making, giving us pride in our achievements; giving us also the right to be proud of the advance in the art and science of illumination, which has brought safety in the streets, efficiency in industry and commerce, elimination of eye-strain and fatigue in class study, and last but not least, has brought comfort, cheerfulness and happiness into the home.

And yet, do we enjoy all of these things? I don't believe we do; not because they are not there, but because we perhaps haven't as yet fully realized the completeness and fullness with which we could enjoy all of them if the application of artificial light was employed properly.

The Organ with Which We See Light

In order that we may know why light should be employed properly it is necessary for us to understand something about that part of our body which functions with light, the eye. Light and sight are related so closely that without one the other would be useless.

The history of the human race might well be sketched in the history of light.

It safely may be said the eye is the most marvelous piece of machinery in the human body. Likewise, the eye is the most flexible and abuse-resisting organ we possess. In main structural characteristics the eye is like a camera, though a

*Educational lecture, illustrated by the use of a special light box constructed for the purpose, given before the luncheon clubs of California as part of the program of the lighting committee of the Commercial Section, Pacific Coast Electrical Association, 1925-1926. Clark Baker, chairman; L. A. Hobbs, vice-chairman; C. D. Monteith, vice-chairman.

camera is more or less an arbitrary medium, whereas the eye is flexible. (Fig. 1.)

In considering proper or improper lighting in relation to the eye, there are two main abuses—gloom and glare; gloom caused by too little light; and glare, by too much light reaching the eye from an improper direction or misplaced light source.

First then, let us consider the effect of gloom on the eye. The human eye, chemically, is adaptable to such a degree that it can differentiate between relative degrees of light, and mechanically adaptable to such a degree as to differentiate form. Therefore, the recognition of detail needs varying degrees of light or illumination upon the form object.

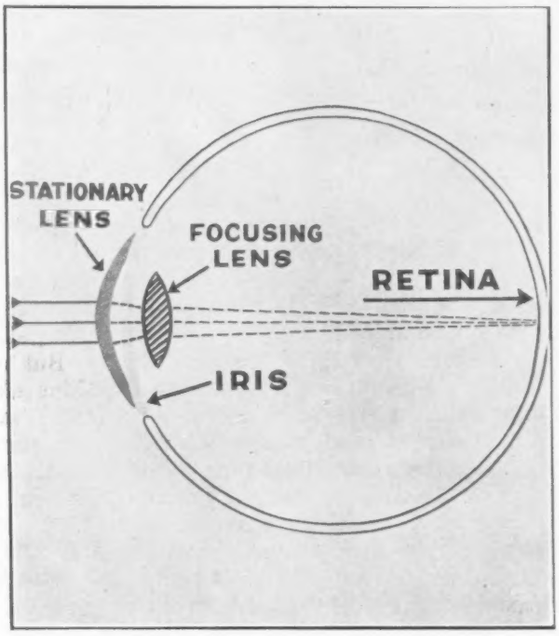


Fig. 1. Light enters the eye through the stationary lens, the iris opens or closes, automatically controlling the amount of light that should be received, then passes through the focusing lens, focusing an image on the retina.

For instance, if we were to have an object 14 or 15 inches from the eye (which is normal reading distance), with sufficient light upon it, an image of a certain size would be focused on the retina of our eye. Assume, however, there should not be enough light falling on the object to be seen clearly at this distance. The only other thing to do then is to draw the object closer to the eye, which would enlarge the image on the retina. (Fig. 2.) But in doing this, we do two things, one dangerous, the other unnatural. The dangerous thing is accident hazard; the nearer a worker's eyes are to moving objects, the greater the danger of accidents to them. Likewise, in the case of fast-moving machinery, there is the danger of clothes getting caught, and so on.

The unnatural thing is that whenever we bring an object close to our eyes we have to turn the eyes inward so as to focus properly, and this demands muscular effort on the part of little delicate eye muscles. These eye muscles are not made for prolonged exertion, but are made for fine and quick adjustments. This prolonged turning-in (Fig. 2a) taxes the nervous system and produces one of the most common forms of eye-strain.

Furthermore every inch closer to our faces that we bring an object shortens our focus. This also is an act that nature never meant us to maintain for long periods of time. The mechanism back of this act is one of the most delicate muscular parts of the entire body, and the drain upon nerve energy from this source produces not merely eye-strain but extreme general bodily fatigue.

We shall turn now to the equal and much more common matter, glare. This, you will remember, we spoke of as too much light reaching the eye from an improper direction, or misplaced light source, and inasmuch as we demonstrate glare and its effect a little later, we shall pass it for the moment and describe it at the time of its demonstration.

We spoke of safety in the streets. Surveys conducted in the larger cities where they have what is commonly called "White Ways" or "Paths of Gold," together with other well-lighted streets, show a 78-per cent decrease in crime, likewise a 31-per cent decrease in street accidents. These results are directly traceable to the scientific study of illumination in the streets by lighting experts and specialists. A totally different study is required in the down-town section of a city from that of a semi-business district, while the outlying and residence sections require still another application.

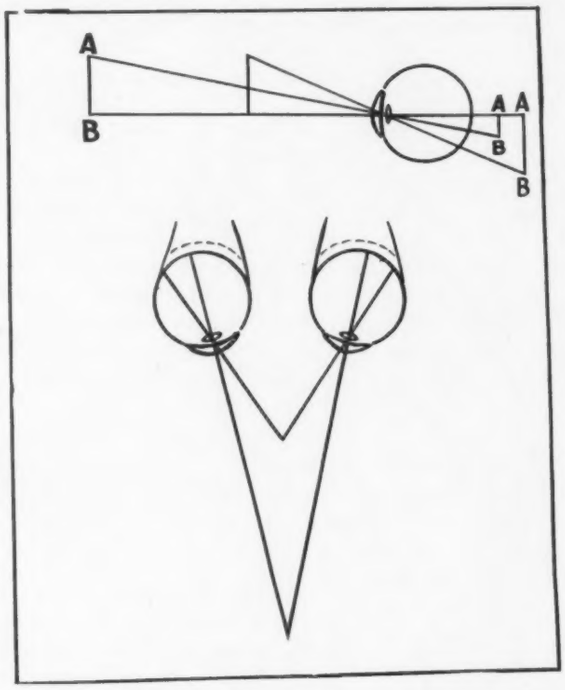


Fig. 2. What happens when an object is brought closer to the eye because of insufficient light. The object at A throws an image upon the retina of a certain size. Brought closer to the eye, the image upon the retina is enlarged. Fig. 2a. shows the abnormal position which the eyes must assume when the object is brought nearer and the strain which must be experienced by the delicate eye muscles to meet this condition.

Good Light for Young Eyes

From the street we enter the schoolroom. This phase of lighting has had a more extensive study by lighting experts than many other phases of lighting because it first of all affects our younger generation. Likewise, by reason of more experience and experiments in this field, more data have been compiled. Recent extensive surveys have shown that at least 25 per cent of our school children have defective eyesight. In the lower grades the percentage is less than this, but there are marked increases in the number and extent of eye defects as the children progress through the school life.

Let us consider for a moment that official figures as to school enrollment in the United States are placed at 24,000,000 children. Of these it has been estimated officially that 25 per cent, or 6,000,000, have defective vision. Of those having defective vision it has been estimated further that 67 per cent, or 4,020,000, are retarded in their study from this cause. At the cost of $64.15 per pupil per year, established as an average by the schools of the nation, this means that $257,800,000 is used ineffectively because of:

Poor control of natural light.
Incorrect artificial light.
Glare from highly polished surfaces.
Home reading in poor light, or none at all.
Distance at which work is held.
Poorly lighted blackboards.
Blackboards wrongly placed in respect to windows.
Too much contrast in room.
Lack of education on the use of light with respect to the eye.

A detailed discussion of each of these items would be a story in itself. However, they have been and are agreed upon by not only illumination engineers but those in authority on optometry, also by physicians who specialize on the eye, together with the executives of our educational institutions, as being those things that are partly responsible for this 25 per cent of children having defective vision. These same authorities agree correction of the items mentioned will remedy this condition.

The growing use of schools for night courses makes it doubly important that lighting specialists

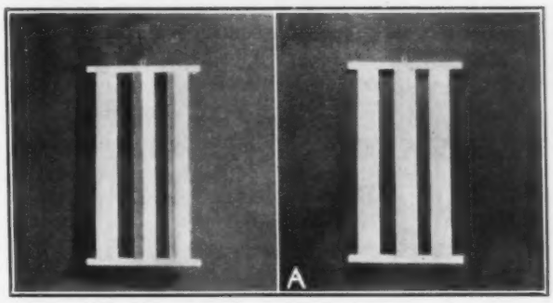


Fig. 3. The direction of light upon an object determines the position of the resulting shadow. Sharp shadows will confuse as to the true position of the object, for often the object will become confused with its shadow. However, without shadow we cannot observe objects in their three dimensions.

give their best efforts to research and study of this field of lighting, since the night classes are of necessity entirely dependent on artificial illumination.

As a result of the work of illuminating engineers and specialists, a code of lighting school buildings has been prepared by a committee consisting of twenty organizations and societies identified with school-lighting problems in one or another of its various aspects. The American Engineering Standards Committee has approved this code as the

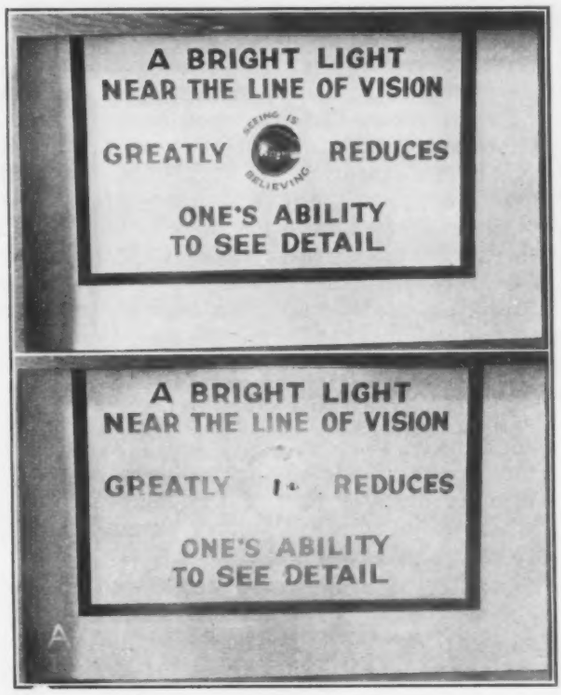


Fig. 4. Effect of glare is shown by the inability to read this glare chart when light in the center is turned on full.

American standard. It now serves as a guide for the enactment of legislation on school-lighting and also provides architects with detailed information on which to base proper school-lighting specifications. This is an achievement makers of artificial light are proud of.

The Worker Needs Adequate Light

As we approach industry, the factory or manufacturing plant is our first contact. In this field lighting engineers and lighting specialists have many accomplishments and achievements marked up to their credit. However, here we must effect economic efficiency. We have been able actually to increase production by reason of good illumination and have decreased spoilage to a very large extent by reason of good illumination, together with largely eliminating accident hazards. This latter is of prime importance and has had much of the lighting engineer's time.

Insurance and Accident Commission statistics show that 18 per cent of all industrial accidents are due to poor or inadequate illumination.

To demonstrate one or two lighting principles which are effective in the factory, let us consider first the question of shadows. If sharp shadows are permitted, the object will be confused with its shadow. Likewise sharp or heavy shadows will confuse as to the true position of an object. (Fig. 3.)

The opposite to this is the absence of shadows. Without shadow we cannot observe objects in their three dimensions. An equal amount of light falling upon object from all directions does not permit true form recognition. There is a happy medium between sharp shadows and the entire elimination of them that speeds labor and prevents accidents.

The next demonstration is one of the greatest evil in lighting practice, glare. It not only reduces one's ability to see detail clearly and quickly but has been known to effect temporary blindness.

This chart (Fig. 4) shows what occurs when glaring light enters the eye. You now are looking right into the eye; this outer circle represents the retina. Every sensation we have of sight is first registered upon the retina, light, color, form, everything. This little spot 1/50 of an inch in area is the center of **form vision** as distinguished from light perception. Glaring light or too much light entering the eye from an improper direction over-stimulates or over-lights the area around this central point to such a degree that form vision or recognition is destroyed.

A study of these things we have just demonstrated, namely, shadows, glare and light diffusion, does not confine itself to factory work alone, but comes in for a major part of the engineer's attention when we go into the factory executive's office or into offices generally.

We find in clerical work with too low an intensity of lighting that the eye soon is fatigued, while glaring light sources or glaring reflection surfaces, such as glass-topped desks, glossy or shiny paper, seriously impair the efficiency of employees. With dancing or shifting shadows on typewriter keys, eye-strain is introduced. These effects are particularly serious in clerical and stenographic offices where a high percentage of women are employed. A study shows that women by nature are more sensitive to such effects than men. Lighting engineers, time after time, have increased efficiency in office work and reduced the number of absentees by properly installed high-intensity lighting in offices.

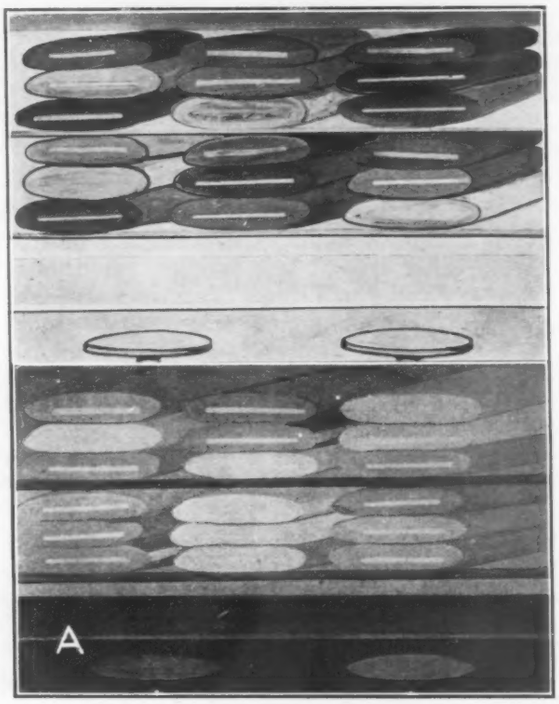


Fig. 5. The light goods department of a store seems brighter because the light goods reflect more light. Fig. 5 a. With the same amount of light falling upon them as in Fig. 5, dark goods will reflect much less light and therefore require more.

There are many other elements entering into office lighting, such as kinds of paper used, objects of brightness, placing of desks for natural light vs. artificial light, desk lamps and similar factors. Time here does not permit a discussion of these, and it is to be regretted, for their importance goes hand in hand not only with the efficiency, but the comfort and health of the office employee.

Light That Helps to Sell

In a store also the question of employees' comfort and health has been effectively dealt with. Store merchandisers have warmly received and highly praised makers of artificial light for their contribution to better merchandising by reason of better lighting. Unselfish and non-commercial study has been made by specialists in this field, all of which now, however, have a commercial value to all concerned. This is the natural outcome of research work. Modern merchants, satisfying themselves of the value of the right kind of light, now demand it as an integral part of modern merchandising.

The term, "right kind of light," covers a great many points, all of equal importance. A discussion of each perhaps would be interesting. We shall confine ourselves, however, on account of time, to a demonstration of one principle largely involved, that is, light absorption.

This demonstration will show why one section of a store will have a different appearance from that of another section, when the lighting units used are the same in each case. (Figs. 5 and 5 a.) These conditions, once understood, are easily corrected. And many other things, presumably as simple, have brought about a greater understanding and appreciation of light principles and fundamentals as applied to the merchant.

Another important appreciation of light that the merchant today has is the psychological effect it has upon a purchaser, who may shop more readily and more comfortably under good illumination than poor illumination, and as before mentioned, upon the employees, that is, the salespeople, who are more cheerful and whose health is better when they work under the right kind and the right amount of light.

Merchants likewise have responded to engineering and research data as to the value of good lighting in show windows. They know that light has a definite attracting or pulling power to their show windows. They know a window with a high intensity of light attracts more people to it than one with a low intensity by as much as 70 per cent.

This percentage figure is variable but it is a recognized average. Many merchants, especially the larger ones, place a dollar-and-cent value on

their windows. The added percentage of pulling power by light is in direct proportion to the dollar-and-cent value; that is, a window with a value of $100 per hour, with a low amount of light, when changed to a greater amount has an added pulling power of 70 per cent, now giving it a value of $170 per hour.

Color lighting is now being recognized as having an added value when properly used for displaying merchandise in show windows. The simple arrangement of strips of colored ribbon, shown in Fig. 6, serves to demonstrate this very well. These strips of ribbon are white, green, orchid, purple, and light blue, from left to right. With a red light upon them, the white changes to red, the green to black, the orchid to a light red, the purple to a deep red and the light blue to silver. With a yellow light upon them, the white becomes yellow, the green remains green, the orchid becomes pink, the purple an orange-red, and the light blue a green. With a green light upon them, the white becomes green, the green remains green but is darker, the orchid becomes a gray, the purple a reddish black, and the light blue a gray.

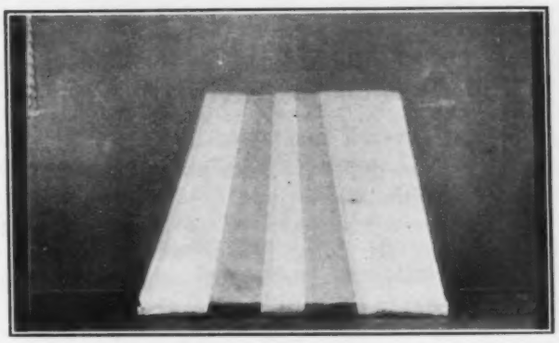


Fig. 6. The colored ribbon board, when seen under different colors of light, seems to change into different colored materials.

A knowledge of pigment colors and light colors permits us to use both of them to the greatest advantage in the show-window, even to the background.

Keeping Home Lights Burning Rightly

Color also comes in for its share of consideration in the home. Here there is no limit to how far a skilled designer may go in producing pleasing and unusual effects by the control of high lights, shade, and color.

We find, however, there are as many different ideas on design, color harmony, and like items, in the home as there are individuals who control the home. One consideration which always should be emphasized in the home is that illumination should be soft and free from glare. All lamp bulbs should be shaded. From there on, personal tastes may be the guide. Occasionally, however, we find decorations and furnishings which have been selected for their rarity, or possibly their beauty, destroyed by artificial light. The beauty of such furnishings and decorations is enjoyed only during daylight hours. It should be enjoyed equally under artificial light, and can be if some consideration is given the lighting condition surrounding the furnishings, for artificial lighting may be used as a decorative medium or merely as an ornament.

Consider the case of a floor lamp typical of those in many homes of today, with red shade and red globes. Let us assume for a moment this

Fig. 7. The interior of the home needs care in lighting. Use a clear light or light tint for general illumination and colored floor lamps for decoration.

lamp in a room where because of its beauty a mulberry floor covering has been selected. Likewise, for its harmony with the color of the rug, together with its comfort, we will assume blue mohair furnishings; again, assume a neutral tone wall covering.

If we were to bathe our room in the red light of the floor lamp, the mulberry rug becomes a red rug. The blue furniture pieces become black, and the wall is bathed in red. The original design of the room has been destroyed. (Fig. 7 shows room arrangement.) This need not be. Let the floor lamp be used as a reading lamp, or as an ornament, and let the room be bathed in clear light which does not destroy our room design. A tinted light may be desirable and often may be used.

I hope these demonstrations have given each of you something. For me, I am one of the workers of artificial light, the light that man controls, the torch of civilization's march onward.

A great writer once said, "Blessed is the man who has found his work," and plainly thought that the greatest blessedness. We have most of us heard these sentences, but probably thought they were meant only for artists or people like that. But that is not so—it's for you and for me—and this is my work.

Denver Would Regulate X-ray Machines.—Finding that the supervisor of radio of the Department of Commerce has no power to regulate radio interference caused by high-frequency electrical machines such as X-ray or violet ray, the city council of Denver recently called upon its attorney to draw up an ordinance providing for such regulation. This is believed to be the first attempt on record to regulate such apparatus with respect to radio reception. The regulation of the high-frequency apparatus, it was stated, probably would take the form of prescribing certain shielding requirements which are claimed to eliminate the trouble.

Electric Heating in the Modern Home

By H. E. Sandoval

Sandoval Sales Company, San Francisco

THE electric home today is not complete unless all energy for lighting, cooking and heating is received through the electric meter. In this article the author specifies the equipment for this new electric home and gives some pointers on how the industry can better sell it to the public.

FOR the past three decades a person was considered as having an electric home first, when he had his home wired for electric lights; second, when he installed lamp-socket appliances such as the electric iron, vacuum cleaner, washing machine, and similar equipment, and third, when he added the electric range.

Today a person does not have an electric home unless all energy for lighting, heating, cooking and power purposes is received through the electric meter and one bill from the electric company covers everything.

The equipment in this home consists of 110-volt lamps and fixtures, 110-volt appliances, such as toasters, waffle irons, cleaners, and the like, an electric range, an electric water heater, large-capacity electric air heaters (1,000 to 6,000 watts), an electric ironer and an electric refrigerator.

The wiring consists of a heavy 3-wire 110-220-volt main service, usually 3 No. 2 wires; 110-volt lighting circuits; 110-volt appliance outlet circuits; a 3-wire 110-220-volt range circuit; a 220-volt water heater circuit, and a 220-volt circuit for each heater or heating device over 660-watt, capacity.

Before going further it is well to state that the all-electric home is made possible by a favorable combination of two factors, namely, climatic conditions and low rates for electric energy. This article has to do primarily with climatic conditions as found in California, and a combination lighting and heating rate for electricity in that territory for an eight-room house, as follows:

First 30 kw-hr. per month at 7c.

Next 150 kw-hr. per month at 3½c.

All over 180 kw-hr. per month at 2c.

A yearly minimum of approximately 50 cents per month per kilowatt of connected load is in effect.

In an average home of eight rooms or less 30 kw-hr. ordinarily covers the lighting, 150 kw-hr. covers the cooking, and the heating is considered as being carried on a 2-cent rate.

The most important thing regarding the all-electric home is the cost of operation, and it is interesting to know that there are many homes of from five to eight rooms using from $200 to $300 of electricity per year. This is put on a yearly basis rather than monthly on account of the heating. This amount is divided about as follows:

Electric lighting and appliances, $30 per year. Electric cooking, $60 per year. Electric water-heating, $60 per year. Electric heating, $50 to $150 per year. Making a total of $200 to $300 per year.

Compare this with the ordinary home, and for this purpose the following figures should be adjusted to local rates and prices:

Electric lighting and appliances, $30 per year. Gas cooking, $25 per year. Gas water heating, $50 per year. Heating (coal and wood), $75 per year. Making $180 per year.

Most people see only the fuel item which enters into the cost of operation of a home, whereas this is only one of several, and sometimes not the most important. The items contributing to the total cost are as follows:

1. Interest and taxes on first cost of equipment.
2. Maintenance of equipment.
3. Depreciation of equipment.
4. Labor necessary to operate.
5. Fuel or energy.
6. Health and safety.
7. General desirability.

Tangible values can be placed on the first five factors and electricity is the lowest of all, except 5 (fuel), which is practically the entire cost. However, there are certain intangible values in the last two items which often prove the deciding factor for electricity. When the sum total is taken it will be found that the electrical home is just as economical as any other and far more desirable.

The all-electric home appeals primarily to that family in moderate circumstances which is buying its own home and where the wife with a couple of kiddies to look after is doing her own work. A servant is expensive and hardly can be considered, but a few extra dollars for electrical servants produce most saisfactory results and prove far more economical and dependable.

Electric cooking has made such rapid progress during the last few years that it has become an accepted fact by most progressive housewives, and it is only a question of time and opportunity when the electric range takes its place in the kitchen. Housewives have come to know that it really costs nothing to operate an electric range, for the savings in time, labor and food more than pay the electric bill.

Not so much is known of electric water-heating

and electric air-heating by the public and these, although just as meritorious, require a little more educational work before they are used universally.

With electricity at 2 cents per kw-hr., the cost of operation is the dominating factor in electric water-heating and practically determines the type of equipment used. Intermittent heating is the

Electric heating is essential in the modern home electric.

cheapest method of heating water, as radiation losses are minimized and less hot water is used than where a supply of hot water is available at all times.

An external circulation type of heater banks the water at the top of the boiler where it can be drawn off readily after the heater is started. A 5-kw. heater is the most popular on account of its speed in intermittent heating. All boilers and pipes should be lagged thoroughly which minimizes radiation losses and tends to keep the tank hot after the heater is turned off.

Heaters should have an automatic thermostatic cut-out as insurance against heater burn-outs and fire hazard. Such a thermostat also permits of turning the heater on and automatically maintaining a tank of hot water.

In the ordinary home of from five to eight rooms it has been found that intermittent water-heating takes from 150 to 250 kw-hr. per month, which at a 2-cent rate, amounts to $3 to $5. Where the water in a tank automatically is maintained hot and a hot-water service is always available, the consumption just about doubles, namely, 250 to 500 kw-hr. per month, or $5 to $10. This is due to increased radiation losses and increased use of hot water. This service is most satisfactory, but in competition with gas at $1 per 1,000 cu. ft. it proves more costly.

In order to compete, an auxiliary tank has been developed which provides a limited hot-water service continuously without heating the main tank. This tank takes care of all ordinary wants, such as cooking, dish-washing, and similar uses, and when large amounts of water are required the main tank is heated by opening a valve. The service is quite satisfactory, and the consumption varies from 200 to 300 kw-hr. per month, which places it on a par with competitive heating.

Water heaters which are well designed and constructed are fairly free from burn-outs and require little service over a long life.

Selling electric air-heating in the home at first meets with resistance from consumers on account of previous experience with lamp-socket (660-watt) heaters. They have used these heaters on lighting rates and have failed to get sufficient heat but have received high bills for electricity.

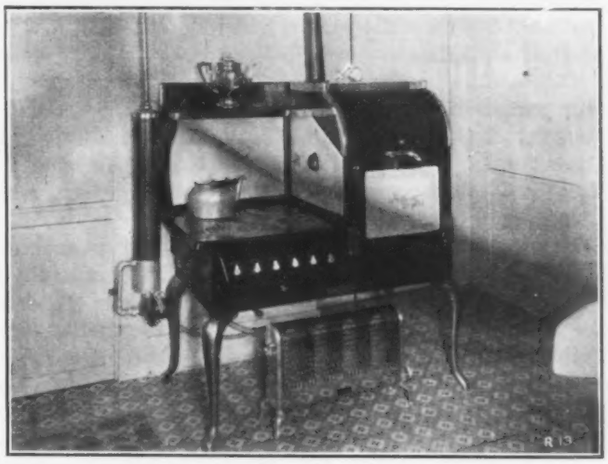
The 660-watt radiant heater has a very definite field and when properly sold gives most satisfactory service. It is not intended to heat a room any more than a pocket flashlight is expected to light a room. Both give an intense beam over a limited area only. For spot heating, the radiant heater proves very satisfactory but for raising the temperature of any but the smallest rooms it is necessary to have heaters of 2 to 6,000-watt capacity.

Heat may be classified under two general headings—radiant heat and convection heat. A high-temperature mass gives off radiant beams which pass through air without heating it but heats solid objects upon striking them. The rays from the sun are examples of this.

Air passing over or coming in contact with a hot mass at comparatively low temperatures absorbs heat and rises and this is known as convection heating.

With radiant heat, the solid objects in the room are at a higher temperature than the air and heat it. With convection heating the air is at a higher temperature than the solid objects and heats them by contact. It readily may be seen, therefore, that for raising the room temperature convection heat is more effective than radiant heat.

Practically all electric heaters use one principle or the other or a combination of the two, which



Electric water heater, range and air heater are part of the modern kitchen.

seems the most desirable. A radiant convection heater dissipating the bulk of its heat by means of convection air currents but giving off a small amount of radiant heat for quick heating and coziness has proved most satisfactory.

There are four essential features to a good electric heater for room-heating in the home. (1) It

should have a comparatively small amount of radiant heat as explained above. (2) It should contain as little mass as possible in accordance with good construction. The greater the mass, the greater the amount of heat stored in the heater that is not immediately available for heating the air. (3) The heater should operate at a sufficiently low temperature so that the dust particles in the air will not be scorched and burned, thereby soiling the walls and ceiling. (4) The heater should be so constructed as to require little maintenance and have long life.

It is customary to install a heater in each room of such a size as to give a comfortable temperature on the coldest winter days. There are few extremely cold days, and it follows that for the average winter day the heater is larger than necessary.

Heaters are all equipped with three heats so that they may be turned down to meet any condition. The large heater also has the feature that, when a cold room is entered the appliance may be turned on full heat for a few minutes which will rapidly raise the temperature, and after that it can be turned to a lower heat.

With a difference in temperature between the outside and inside of a room, a definite heat transfer takes place from the walls, floor and ceiling, and it is necessary to supply that amount of heat to the room. With ordinary good construction in a house, 1½ to 2 watts per cu. ft. will produce a temperature rise of about 30 deg. F.

Electric heat is flexible and available in just the quantity desired at all times. One or all the rooms in a house may be heated as required. Automatic heaters will maintain even temperature, doing away with extremes of heat and cold. A hall heater usually will keep the chill off the entire house.

Portable heaters may be moved to suit the housewife's convenience, or stationary heaters may be installed in the walls where they are out of the way and take up little space.

One of the big advantages of electric heat is the elimination of flame and combustion with its consequent fire hazard, and the labor and dirt that go with it. This is of considerable importance in the home with small children where health and safety are paramount.

Electric heaters also are used with furnace installations for those chilly fall and spring days when it is uneconomical and bothersome to start a furnace for just a few minutes but uncomfortable without some heat.

There are many advantages to the all-electric home but it seems unnecessary to enumerate them. The public generally accepts the electric home as better and more desirable than any other, but is dubious as to the operating cost. In this article I have endeavored to show how, all things considered, the electric home is just as economical as others less desirable. A comparable illustration is this—the cost of **kerosene** for lighting is less than the cost of **electricity**, but the almost universal use of electricity for lighting where available would indicate that **electric lighting** is more economical than **kerosene lighting** when fuel, labor, maintenance, fire hazard and similar factors are taken into consideration.

It is simply a matter of education, and before long in certain sections of the country the electric home will predominate. Most people are "from Missouri" and they are rapidly being "shown." At present the electric home is making most rapid progress where the housewife is doing her own work and looking after a couple of kiddies. To her it is a source of pride and the greatest labor-saver possible.

There are others to whom the electric home represents something "better," and they are willing to pay a little more for comfort and convenience. The first cost of building an all-electric home is usually less than that of a similar home of different type, and after a year's operation, much to their surprise, the owners generally find that they have saved money.

To summarize, the following question might be asked: "What does the all-electric home mean to industry?" To the contractor it means a wiring job of from $150 to $300, instead of $50 to $75 as at present; to the dealer it means the sale of $200 to $500 of equipment which would otherwise go into other channels; to the electrical jobber and manufacturer it means additional sales of from $200 to $400 per home; to the power company, a revenue of from $200 to $300 per year, instead of $30. Last, but not least, to the consumer it means comfort and convenience at reasonable cost.

Utilities Commission Cannot Fix Community Boundary

A recent decision rendered by the Colorado supreme court ruled that the public utilities commission of that state exceeded its authority in attempting to fix a boundary around a given community, outside its corporate limits, within which boundary a utility could not operate.

The case in question was that of the state vs. James Pirie and the Clear Creek Power & Development Company. In 1923 Mr Pirie applied to the Colorado Public Utilities Commission for permission to furnish light and power to Idaho Springs under a franchise he held. The application was denied on the grounds that the Colorado Power Company, now a part of the Public Service Company of Colorado, already was serving the community and that the prior rights of that company must be respected. However, the commission also denied the Clear Creek company the right to extend its lines "into the Idaho Springs district." The lines were run into the town of Dumont, near Idaho Springs, and the commission through the district court sought an injunction against Mr. Pirie and the Clear Creek company. The injunction was denied.

The district court ruled that while the commission was within its rights in denying Mr. Pirie the right to extend service lines into Idaho Springs it was not legally justified in defining the limits of the Idaho Springs district.

Constructive Co-operation

By Lester S. Ready

Chief Engineer, Railroad Commission of the State of California

THE duty and obligation of the public utilities of the state is to render good service, continually improving service, at reasonable charges to the public. The main object of the utilities activities, to their owners, is to make a fair and continuing profit on their property through the rendering of satisfactory service to the public. Under regulation the speculative feature which exists in other enterprises practically is eliminated, competition with its duplication of capital and unproductive activities in most cases is removed and the utilities' business becomes primarily that of efficient construction and continuous operation.

"A VITAL and integral part of the scheme of public utility service under regulation is the consistent pursuit of inter-company consultation between technical staffs of the various utilities." Thus does Mr. Ready characterize this phase of utility activity. He gives some interesting information and draws some interesting comparisons in support of his view.

A careful analysis and observation of utility service brings out the fact that it is not possible fully to obtain by regulation the natural urge for improvement of service and efficiency that is obtained under active competition. However, there are many advantages gained under regulation that more than offset this disadvantage. Duplication of capital and expense is eliminated. Efforts of the utility's staff can be directed to constructive work and away from duplication existing under competitive conditions. The greater assurance of continued usefulness of investment and dependability of operation makes possible greater standardization, uniform public treatment, more permanent development and construction and, if correctly guided, a concentration of effort toward efficiency and service. The necessity of retaining trade secrets from other like utilities vanishes. Not having direct competition nothing is gained by the failure to discuss frankly improvements that have been developed. In fact much is lost to the utilities and to the public if such is not done.

It is to the general advantage of all utilities and likewise to the advantage of the public served that there be free exchange of ideas and experiences between utilities. Each utility has certain practices and methods which are an improvement over those of other utilities. Free exchange of ideas, plans and experiences makes possible the application of more efficient and modern methods to the service of the entire territory together with reduction in cost and improvement in efficiency. It stimulates in the staff of the several utilities a greater interest in their work and that healthy competition of effort that is free of duplication. Competition for business between utilities with its duplication of investment and expense is supplanted by competition of brains. Through the medium of various technical and other sections of the associations this healthy and constructive competition is fostered with practically no duplication of expense and is a great urge for efficiency. The competition of the staffs of the different companies in the submitting of improvements and the showing of their utility to be leading in the development of the art does much to maintain a continually improving service.

Inter-company Consultation

A vital and integral part of the scheme of public utility service under regulation is the consistent pursuit of inter-company consultation between the technical staffs of the various utilities for the constructive development of business, the improvement of service, greater safety, increase in efficiency, and for a better understanding with the pubilc. I consider its non-existence would represent a failure on the part of utilities in their responsibility to the public. Freed in the main from competition they cannot rest but must in the progress of our day keep pace with or even lead in the development of their industry.

In the twelve years of observation and investigation of utilities I have seen many good ideas and practices generally applicable to the service of the entire state which have been limited to small fields of usefulness because they have not been more widely known. In the past these useful ideas have been more or less buried even as many men of real talent sometimes are lost in large organizattions. The progressive utilities have put into effect their personnel departments to bring out and develop the men capable of larger fields of usefulness. The larger utilities have their engineering committees for the exchange of ideas within the company for the improvement of its service. Constructive, co-ordinated interchange of ideas on a business basis is only a forward step in the advance of industries.

The more progressive electric utilities recognize the value of the interco-operation outlined in the preceding paragraphs and are making a bus-

iness of inter-company consultation through the various technical sections of their associations. In these cases a free exchange of ideas and experiences together with a frank discussion of operating problems has done, is doing and can continue to do much to improve electrical service to the public.

Other Utilities Have Similar Practice

Utilities other than the electric utilities also have gone to a great extent in making a business of constructive inter-company consultation and joint research. Much of the great success in the telephone communication service that we have today is due to the diligent pursuit of joint research, co-ordination and development. The nature of the telephone business has made this necessary earlier than with other utilities. The formation by the American Telephone & Telegraph Company, which controls the majority of the telephones of the nation, of a national research and development organization for the benefit of all of the main telephone utilities in the United States has done much for the benefit of the public in the way of good service. In this organization, which is supported through charges to the associated companies, the exchange of operating experiences and research for the entire national system is carried on. Interchange of ideas and research were placed upon a business basis.

Ten or fifteen years ago the gas utilities were considered to be in danger of retrogression. Some predicted that they were becoming obsolete, inadequate, and would be superseded by other forms of service particularly electric service. One of the difficulties was that progress and development were almost at a standstill. The industry was old compared with the electrical industry. Regulation was not easily accepted; the urge to progress under regulated monopoly had not developed. A frank and open exchange of ideas and thoughts between the different utilities did not exist in a healthy way. In fact in some sections there seemed to be more misinformation exchanged than facts. As a result this business was tending toward decadence. In the last ten years a different condition has developed. It has been realized that the future of the gas industry depends upon a co-ordinated constructive working out of the various problems by getting together for frank discussion of the problems of that industry.

The gas companies of California in the past five years have joined together in a definite program of constructive co-operation by making a business of the interchange of ideas and the co-ordination of research under a joint research council supported by the utilities. They have formed a consulting board for all of the utilities, consisting of the best technical brains of the gas industry of the state, where problems are discussed and where research into the operating difficulties of the companies are outlined and co-ordinated. As a result the utilities today have a State Gas Consulting Board which is of material benefit to the public utilities and the public throughout the state. The results of this wholehearted, frank and open discussion of problems between these utilities, directly from the research carried on and indirectly through the more enthusiastic efforts which have been developed within the utilities in the improving of their service, have been worth much more than the cost. The gas utilities are far from being in a decadent condition. Their growth in California has been almost as spectacular as that of the electrical industry. Their service is so greatly demanded that it taxes the ability of the utilities to meet the requirements. Further, the companies are prosperous. It is not claimed that the co-ordination of effort in this state and other parts of the country has been the whole cause of this great change of conditions, but it has been an important contributing factor.

Southern California Edison Customer-Owners Now Number 85,639

DURING 1925 the Southern California Edison Company sold to the public under the customer-ownership plan capital stock of a par value of $24,822,400. The number of new stockholders secured during the year was 17,239, and the actual cash receipts from stock sales amounted to $23,697,780.20. The major portion of the new stockholders are consumers of the company residing in southern California.

In excess of 10,000 of the new customer-owners were secured through the efforts of the Hundred Thousand Club, an organization of Edison employees (see Journal of Electricity, Oct. 1, 1925, p. 242).

Since the customer-ownership plan was put into effect by the Edison company in 1917, the number of new stockholders has been increased from 1,864 to a total at the close of 1925 of 85,639. The par value of the stock sold during this eight-year period is $85,910,200, and cash receipts on account of these sales have been $78,116,487. The following table shows the year-by-year sales since 1917:

Year	No. of Stockholders Acquired	Par Value of Stock Sold
Prior to 1917	1,864	
1917	1,988	$3,114,600
1918	185	181,900
1919	3,349	4,609,300
1920	181	867,400
1921	19,161	17,280,100
1922	21,749	14,562,000
1923	17,529	6,000,000
1924	2,394	14,472,500
1925	17,239	24,822,400
Totals	85,639	$85,910,200

Plans for 1926 call for the addition of at least 20,000 new stockholders, with the customer-ownership program under the direct supervision of R. H. Ballard, vice-president and general manager of the Edison company. That expectations will be reached is indicated by the customer-owner sales for January, which were in excess of $3,000,000.

Tests on Steel and Wood Poles*
Part 1—Steel Poles

In submitting this report it is desired first to give recognition to the fact that the studies of previous subcommittees have furnished the basis from which the present subcommittee worked.

At this point it is well to say that the wood pole still has its field of usefulness in supporting overhead lies of all descriptions. It is believed, however, that the steel pole has entered the field in competition with the wood pole. At the present steel poles are used only for the support of circuits of prime importance or where special conditions make the use of wood poles not feasible. Two factors are expected to be prominent in advancing the general use of the steel pole. These are, first the growing scarcity of wood poles of satisfactory quality and their constantly rising cost and, second, the decrease in steel-pole costs as designs are standardized and greater quantities are used.

The purposes of this first section of the report are:

1—To suggest possible standard requirements for the design of steel poles to meet the four loadings shown in Table I.

2—To furnish two proposed standard designs of steel poles, together with estimates of cost, these poles to conform to the so-called light-loading for certain California areas as specified in General Order No. 64 of the Railroad Commission of the State of California. It is not the committee's idea that these two poles shall satisfy all possible needs, but that they shall provide a definite basis from which to work up necessary designs in standardized poles.

Advantages and Disadvantages

The advantages and disadvantages of steel poles have been discussed in previous reports and they will be only summarized here. Briefly they are as follows:

Steel Poles

Advantages: 1. Practically permanent. (Unaffected by fire, decay, and animal destroyers.) 2—Stronger. (Fewer poles per mile.) 3—Lower maintenance expense. 4—Smaller annual depreciation charges.

Disadvantages: 1—Higher initial cost installed. 2—Easier for unauthorized persons to climb. 3—More difficult to work on and increased danger of linemen if worked on while the line is alive.

Steel Crossarms

Advantages: 1—Practically permanent. 2—Stronger. 3—Lower maintenance expense. 4—Smaller annual depreciation charges.

Disadvantages: 1—Higher initial cost installed. 2—The principal disadvantage is the danger of the shorting of lines by birds when using pin-type insulators. This objection is eliminated when suspension-type insulators are used. 3—Less flexible for general application.

Protection Methods

Several features have been suggested for the protection of men working on distribution lines on steel poles. These are suggestions only, and no recommendation is made other than that this feature be given consideration by future committees. The suggested methods are: 1—Insulation of the pole from the ground. (This would apply up to about 4 kv.) 2—Protective insulator shields attached to pole. 3—Insulating shoes to be used in conjunction with insulating gloves. 4—Sectionalizing switches for killing the portion of the line to be worked on. 5—Insulated tools for working lines alive, such as described in H. H. Minor's report on the "testing of high-voltage in-

TABLE I.—Conductor loadings

Type of loading	Radial thickness of ice, inches	Wind Load on Projected Diameter, Lbs. per sq. ft.
Heavy	½	8
Medium	¼	8
Light	None	12
Light	None	8

TABLE II.
DATA ON POLES

ITEM	TYPE A			TYPE B	
	Battered Pole Earth Ftg.	Conc. Ftg.	Verti'lPole Conc. Ftg.	Earth Ftg.	Conc. Ftg.
Height–above ground	53ft. 6in.	53ft. 6in.	53ft. 6in.	57ft. 0in.	57ft. 0in.
–overall	61ft. 6in.	61ft. 6in.	60ft. 6in.	65ft. 0in.	64ft. 0in.
–to low wire	40ft. 0in.	40ft. 0in.	40ft. 0in.	43ft. 6in.	43ft. 6in.
Conductor Separation—					
Between Circuits	11ft. 0in.	11ft. 0in.	11ft. 0in.	11ft. 0in.	11ft. 0in.
Between Phases	6ft. 0in.	6ft. 0in.	6ft. 0in.	6ft. 0in.	6ft. 0in.
Weights of Pole (without arm and including ⅛ in. Min. Material)	1,935 lb.	1,460 lb.	1,600 lb.	2,530 lb.	2,050 lb.
One suspension arm				95 lb.	95 lb.
One Pin-Type Arm-Pipe	125 lb.	125 lb.	125 lb.		
–Channel	220 lb.	220 lb.	220 lb.		
Stubs in Concrete		310 lb.	345 lb.		420 lb.
Earth Ftg.–⅛in. Min. Mat'l.	780 lb.			905 lb.	
–¼in. Min. Mat'l.	940 lb.			1,010 lb.	
Alternate Pac. Co. Stl.Co. Ftg. –⅛ in. Min. Mat'l.	680 lb.			825 lb.	
–¼in. Min. Mat'l.	820 lb.			905 lb.	
Total Weight (Assuming Pipe X-Arms for Type A and ⅛ in. Min. Mat'l.)	2,310 lb.	1,835 lb.	1,975 lb.	2,815 lb.	2,335 lb.
Concrete-Cu. Yds.		1.75	1.16		1.75
Estimated Cost of Erected Pole not including insulators	$160.00	$165.50	$162.00	$190.50	$195.50
Cost of Insulators and Hardware	46.00	46.00	46.00	94.00	94.00
Cost of Completed Poles	$206.00	$211.50	$208.00	$284.50	$289.50

Notes:—1-Wts. include 2½% for galvanising.
2-Suspension Insulators for Type B poles.

TABLE III.—Insulator Ties

Size Wire	Initial Tension (Lb.)	Size Tie Wire B. & S. Gauge	Kind of Tie Used (All ties 5 turns each)	Final Tension (Lb.)	Amt. of Slip (inches)	Remarks
1/0	1,125	6	Std.	220	5½	¼ span 250 ft.
1/0	1,175	6	Std.	150	9¼	½ span 250 ft.
1/0	1,150	6	Std.	170	8	½ span 250 ft.
1/0	1,150	6	Std.	325	5	½ span 250 ft.
1/0	1,150	6	Std.	230	7	½ span 250 ft.
1/0	1,150	6	Cross	400	3½	½ span 250 ft.
1/0	1,150	6	Cross	150	8½	½ span 250 ft.
4/0	2,310	4	Std.	850	2	½ span 200 ft.
4/0	2,340	4	Std.	850	2½	½ span 200 ft.
4/0	2,510	6	Std.	300	4	½ span 200 ft.
4/0	2,160	6	Std.	900	2	½ span 200 ft.
4/0	2,410	6	Cross	850	2¼	½ span 200 ft.
4/0	2,410	6	Cross	230	10¼	½ span 200 ft.

Note:—Procedure of test:
(a) Wire pulled up to normal stringing tension.
(b) Tie made on wire at insulator.
(c) Wire released suddenly at one end.
(d) Final tension read on dynamometer at other end.

TABLE IV.—Formula for working loads
(Values given in lb. per sq. in.)

Stresses	Structural Grade Steel (Strength of Materials Subcommittee Values)	High Elastic Limit Steel (P. G. & E. and So. Cal. Ed. Values)
Compression	22,000—67— L / R	30,000—110— L / R
Maximum Tension	22,000	30,000
Bolts—Shear	24,000	24,000
Bolts—Bearing	48,000	48,000
Rivets—Shear	20,000	20,000
Rivets—Bearing	30,000	30,000

* Serial report of pole subcommittee of the overhead systems committee, P.C.E.A. (Prepared by 1924-5 subcommittee, but publication delayed.) E. H. Steele, Pacific Gas and Electric Company, chairman; R. G. Boyles, Southern California Edison Company; J. M. Brady, J. H. Baxter Company; S. M. Bullis, California Oregon Power Company; C. B. Carlson, Southern California Edison Company; L. J. Corbett, Pacific Gas and Electric Company; Walter Dreyer, Pacific Gas and Electric Company; A. S. Glasgow, San Diego Consolidated Gas & Electric Company; P. W. Greenleaf, Southern Sierras Power Company; G. H. Hagar, Great Western Power Company; F. G. Hamilton, Southern California Edison Company; G. E. Honn, Pacific Coast Steel Company; H. E. Luce, Truckee River Power Company; F. D. Morgans, Southern Sierras Power Company; H. D. Nesbit, San Joaquin Light & Power Corporation; C. W. Osborne, St. Helens Creosoting Company; G. A. Riley, Los Angeles Gas & Electric Corporation; H. G. Sharpe, Pacific Coast Steel Company; C. W. Walker, Ontario Power Company; C. E. Young, Pacific Gas and Electric Company.

sulators in service." (Journal of Electricity, June 1, 1925, page 437.) 6—By means of a portable insulated platform.

Design of Steel Poles

The conductor loadings used in the design are listed in Table I.

The characteristics of the various types of conductors in use throughout the United States, together with the loading per linear foot of wire for either of the conditions readily can be obtained from the tables of the Overhead Handbook of the National Electric Light Association. No attempt will be made to include any of these data in this report.

After a great deal of preliminary study had been made it became evident that it would be impossible to design one pole which would meet all conditions and still remain reasonably economical. It was decided, therefore, to design two general types of poles to meet the conditions.

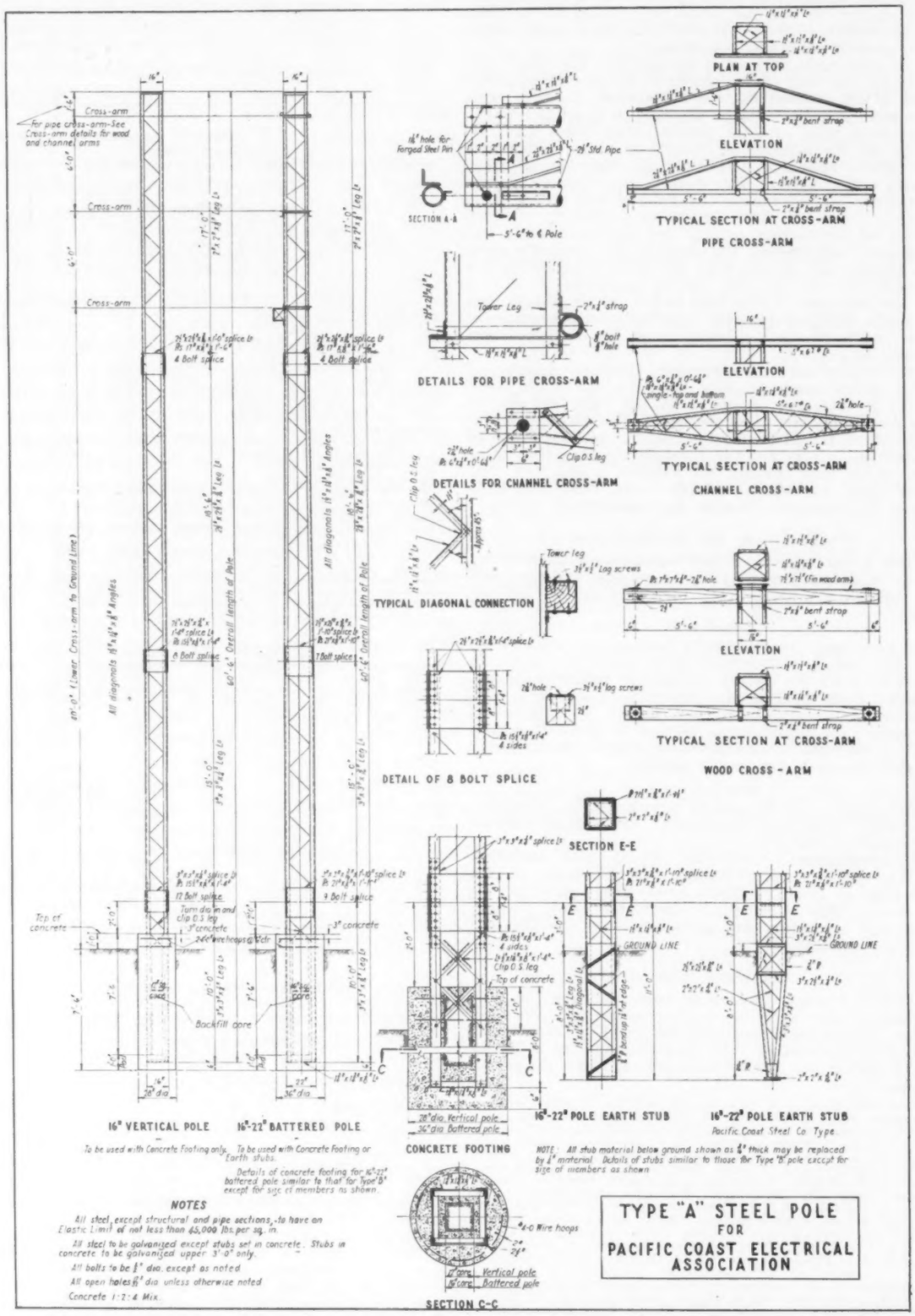

PLAN AT TOP
ELEVATION
TYPICAL SECTION AT CROSS-ARM
PIPE CROSS-ARM
DETAILS FOR PIPE CROSS-ARM
ELEVATION
TYPICAL SECTION AT CROSS-ARM
CHANNEL CROSS-ARM
DETAILS FOR CHANNEL CROSS-ARM
TYPICAL DIAGONAL CONNECTION
ELEVATION
TYPICAL SECTION AT CROSS-ARM
WOOD CROSS-ARM
DETAIL OF 8 BOLT SPLICE
SECTION E-E
16' VERTICAL POLE
16'-22' BATTERED POLE
16'-22' POLE EARTH STUB
16'-22' POLE EARTH STUB
CONCRETE FOOTING
SECTION C-C
NOTES
All steel, except structural and pipe sections, to have an Elastic Limit of not less than 45,000 lbs. per sq. in.
All steel to be galvanized except stubs set in concrete. Stubs in concrete to be galvanized upper 3'-0" only.
All bolts to be ⅝" dia. except as noted.
All open holes ⅝" dia. unless otherwise noted.
Concrete 1:2:4 Mix.
TYPE "A" STEEL POLE
FOR
PACIFIC COAST ELECTRICAL ASSOCIATION

Fig. 1. Design details of light-weight steel pole to meet light-load requirements of California Railroad Commission.

The lighter pole (Type A) is designed for the combination of the following loads simultaneously applied:

1—A transverse load due to an 8-lb. wind on six No. 4/0 bare stranded copper wires on a span of 450 ft. (160 lb. per wire.)

2—A 13⅓-lb. wind pressure on the area of the pole itself, corresponding nearly to a load of 325 lb. applied at the top of the pole.

3—A longitudinal pull in the direction of the line of 700 lb. applied at the end of any crossarm. This pull is the minimum strength requirement for crossarms and conductor fastenings required in paragraph 62 of General Order No. 64 of the California Railroad Commission.

4—A vertical load at the end of all crossarms of 640 lb. corresponding to the vertical component of 900 ft. of wire plus weight of insulators. This is an average value, but in the case of the line following very steep slopes the actual maximum condition should

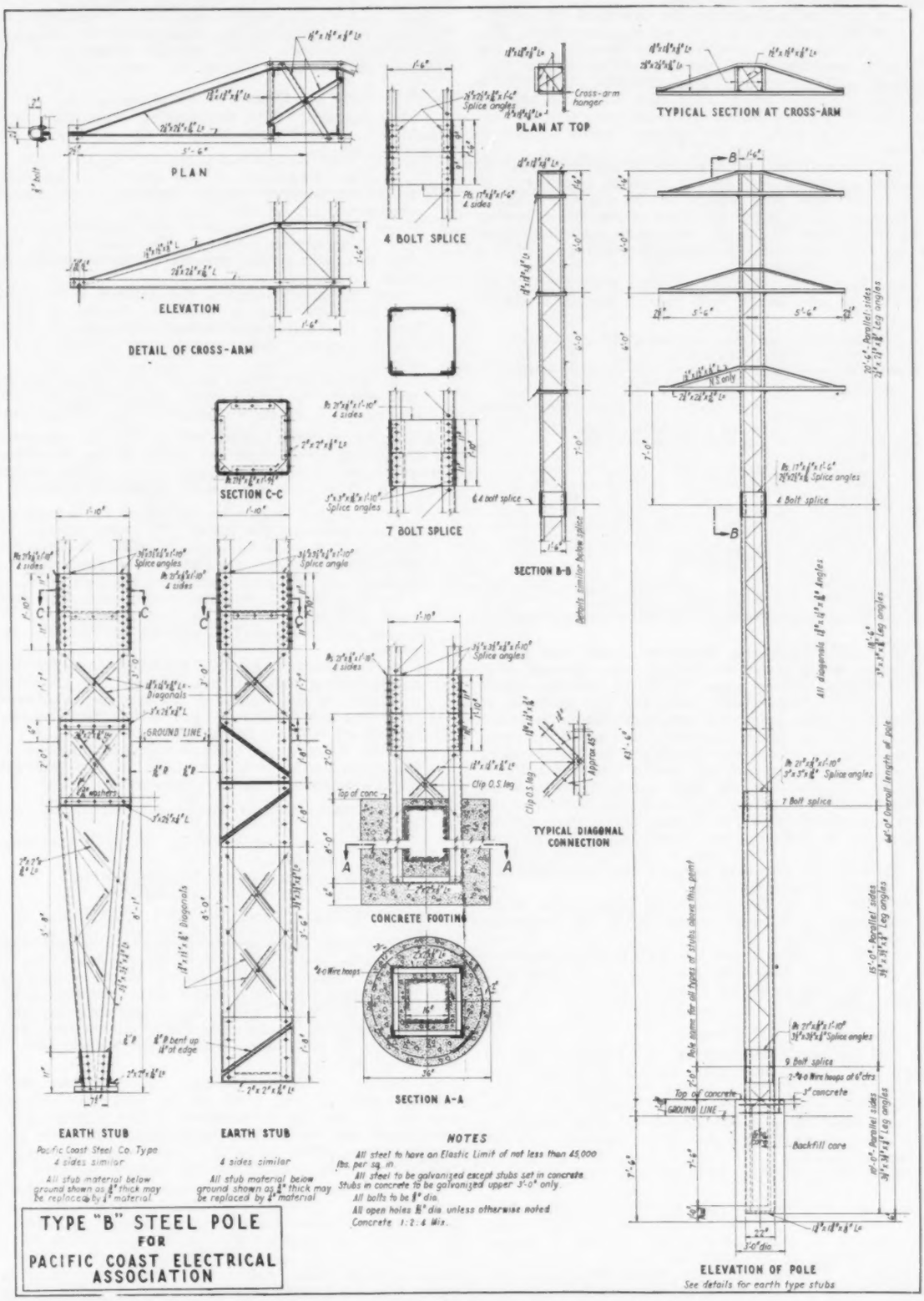

PLAN
ELEVATION
DETAIL OF CROSS-ARM
PLAN AT TOP
TYPICAL SECTION AT CROSS-ARM
4 BOLT SPLICE
SECTION C-C
7 BOLT SPLICE
SECTION B-B
TYPICAL DIAGONAL CONNECTION
CONCRETE FOOTING
SECTION A-A
EARTH STUB
Pacific Coast Steel Co. Type
4 sides similar
All stub material below ground shown as ¼" thick may be replaced by ⅜" material
EARTH STUB
4 sides similar
All stub material below ground shown as ¼" thick may be replaced by ⅜" material
NOTES
All steel to have an Elastic Limit of not less than 45,000 lbs. per sq. in.
All steel to be galvanized except stubs set in concrete. Stubs in concrete to be galvanized upper 3'-0" only.
All bolts to be ⅞" dia.
All open holes ⅝" dia. unless otherwise noted.
Concrete 1:2:4 Mix.
TYPE "B" STEEL POLE
FOR
PACIFIC COAST ELECTRICAL ASSOCIATION
ELEVATION OF POLE
See details for earth type stubs

Fig. 2. Design details of steel pole to withstand loadings heavier than outlined for the type A pole.

be investigated and the strength conditions of the pole further studied.

The heavier pole (Type B) is designed for the combination of the following loads simultaneously applied:

1—A transverse load due to an 8-lb. wind on No. 4/0 bare stranded copper wire on a span of 450 ft. (160 lb. per wire.)

2—A 13⅓-lb. wind pressure on the area of the pole itself, corresponding nearly to a load of 360 lb. applied at the top of the pole.

3—A longitudinal pull in the direction of the line of 1,500 lb. applied at the end of any crossarm. This load would occur in service in the event of one No. 4/0 wire breaking when supported by a five-unit suspension insulator string. The maximum stress in the wires would be 2,400 lb., but this would be reduced to 1,500 lb. by the suspension insulator swinging into and becoming part of the catenary when a wire is broken.

4—A vertical load at the end of all crossarms of 640 lb., corresponding to the vertical component of 900 lb. of wire plus weight of insulators. This is an average value, but in the case of the line following very steep slopes the actual maximum condition should be investigated and the strength conditions of the pole further studied.

On May 8, 1925, a series of tests was made to determine the amount of load that a standard slip-tie made on 60-kv. pin-type insulators would hold if the line, after being pulled to tension, was released suddenly, relying entirely upon the tie to take the shock thus applied. These tests were for the purpose of determining what loads any structure might be called upon to withstand when supporting any given size conductor fastened to pin-type insulators by the standard tie made with No. 6 and No. 4 B&S gage soft-drawn copper. The standard tie here referred to is a tie which is meant securely to fasten the conductor to the insulator. However, it is not meant to be used as a cinch tie to take on any dead-end loads. Experiments have shown that several methods of making the standard slip tie could be used and practically the same loading results obtained.

TABLE V.—Ultimate Shear and Bearing Values for Bolts
(Values given in lb. per sq. in.)

Test made by	DIAMETER OF BOLT ½ Inch Shear	½ Inch Bearing	⅝ Inch Shear	⅝ Inch Bearing	¾ Inch Shear	¾ Inch Bearing
Elec. Bond & Share Co...						
Min. Values	40,000	87,600	40,100	97,000	.....	.....
Max. Values	62,000	102,000	60,800	111,000	.....	.....
Bethlehem Steel Co.						
Min. Values	42,800	.....	42,100	.....	37,500	.....
Max. Values	54,500	.....	48,200	.....	49,700	.....
American Bridge Co.						
Min. Values	33,400	.....	33,500	.....	.....	.....
Max. Values	36,300	.....	37,300	.....	.....	.....
Pac. Gas & Elec. Co.						
Min. Values	39,800	119,000	.....	.....	.....	.....
Max. Values	48,000	146,000	.....	.....	.....	.....
Pac. Coast Steel Co.						
Min. Values	41,500	96,000	49,500	75,000	.....	.....
Max. Values	51,000	100,000	52,000	84,000	.....	.....

Table III shows the results of these tests which are of particular interest, especially in the design of steel-pole structures.

For both the type A and the type B poles the loadings given in the preceding paragraphs represent safe values with test loads 50 per cent in excess of the figures given.

Stresses

It has become customary on the Pacific Coast to design steel towers and poles for two different types of steel. One of these is the standard structural grade with a yield point of about 30,000 lb. per sq. in., and the other is a high-elastic-limit steel having a yield point of 45,000 lb. per sq. in. without any reduction in ductility.

The formulas for the working loads are shown in Table IV.

The shear and bearing values given in Table IV for bolts and rivets are the values for working loads. The ultimate strength of the bolts is far in excess of these values as is shown in Table V, which is a summary of a number of tests made throughout the United States and reported to the national subcommittee on strength of materials.

Materials

A brief specification for the materials is as follows:

Structural grade steel shall conform to the standard specification of the American Society for Testing Materials for Structural Steel for Bridges, Serial No. A 7-21.

High elastic limit steel shall conform to the standard specifications of the American Society for Testing Materials, Serial No. A7-21, in all particulars except that the yield point shall be 45,000 lb. per sq. in. instead of one-half of the ultimate strength.

Bolts and rivets shall be made from material conforming to the standard specifications of the American Society for Testing Materials for Rivet Steel for Bridges, Serial No. A 7-21.

Design of Poles

1—Dimensions: With the loading previously mentioned the general dimensions of the pole were obtained as follows:

a—The dimension of the cage was made as small as possible, being limited to the values shown (16 in. for the Type A and 18 in. for the Type B) by the strength of the connection at the end of each web member. The use of one bolt for this connection greatly reduces production costs.

b—The base dimension was arrived at by making the total cost of pole and footing a minimum. The value therefore is different for poles set in concrete than for poles set directly in the earth.

c—The height above ground was determined by the sag on a 450-ft. span, maintaining the required 30-ft. clearance between wire and ground.

2—Lacing Details: The lacing or web members all are shown attached to the inside of the leg members with the outstanding edges of the lacing angles turned in. This was done for the following reasons:

a—It makes it possible to attach the crossarms at any point on the cage. Thus the pole is not limited in its use to any one class of line, but crossarms may be attached as desired without making any change in details of the pole.

b—It makes for economy when used with concrete footings by reducing the size of hole required and thereby the amount of concrete required.

c—It allows a smaller diameter hole for the earth footing and, further, permits the attaching of plates on the outside of the legs below ground to stiffen the footing by preventing local concentration of loading below the ground.

d—It reduces the cross-sectional dimensions of the assembled pole without impairing its strength and therefore facilitates shipment.

3—Crossarms: Details are shown for four types of crossarms:

a—Standard wood arms for either pin or suspension insulators.

b—Steel-pipe arms for pin insulators.

c—Channel arms for pin insulators.

d—Angle arms for suspension insulators.

The first three arms are designed for a longitudinal pull of 700 lb. at the top of a 60-kv. pin insulator, as required by General Order No. 64 of the California Railroad Commission, in addition to the vertical loading due to 900 ft. of wire. The angle arm for suspension insulators is designed for a longitudinal pull of 1,500 lb. in addition to the vertical loading due to 900 ft. of wire.

4—Footings: Footing designs are shown for steel set in earth and for steel set in concrete. Where concrete is used the construction of the pole is lightened below ground level by eliminating the lower lacing members. The quantity of concrete required is reduced by using a form for the interior portion.

The steel footings set in earth were given more consideration following the tests of 1924. At that time local failure occurred in the footing just below the ground level due to the load becoming unequally transmitted to the ground. One of the leg members bent between panel points. For the tests of 1925 three types of earth footings were designed. One of these was a tapered footing submitted by the Pa-

cific Coast Steel Company, and two were vertical footings with bent plates to stiffen the footing and prevent local concentration of the reaction of the earth. All three types successfully withstood the test. One of these with parallel sides is shown as a suggested standard, with the Pacific Coast Steel tapered type included as an alternate.

Tests on Steel Poles

In addition to the tests included in the 1924 report of this subcommittee a series of tests was carried on in conjunction with this report at the Davis construction warehouse yard of the Pacific Gas and Electric Company on March 17 and 18, 1925. In all six different types were tested and are reported in detail in Table VI.

The arrangements made for the six tests were on

TABLE VII.—Estimated Cost of Steel Poles

ITEM	TYPE A POLES Battered Pole Earth Ftg.	TYPE A POLES Battered Pole Conc. Ftg.	TYPE A POLES Vertical Pole Conc. Ftg.	TYPE B POLES Earth Ftg.	TYPE B POLES Conc. Ftg.
Hauling and Handling	3.00	3.00	3.00	3.00	3.00
Dipping Stub	1.00	....	....	1.00	....
Digging Holes					
By Hand	5.50	5.50	5.50	5.50	5.50
(By Auger)	(2.50)	(2.50)	(2.50)	(2.50)	(2.50)
Erection and Setting	12.00	12.00	12.00	12.00	12.00
Steel at 6c	138.50	110.00	118.50	169.00	140.00
With 3/16" Material for earth stubs. Type "A" Pipe Arm Type "B" Susp. Arm					
Concrete at $20 per yard	.....	35.00	23.00	.....	35.00
Total Cost of Pole (Assuming Hand Dug Holes)	$160.00	$165.50	$162.00	$190.50	$195.50

TABLE VI—Results of Steel Pole Tests Made March 17, 1925 at Davis, Calif. under auspices of P. C. E. A.

Test No.	Description of Pole	Description of Footing	Description of Hole Dug	Point of Load Application	Load in Pounds	Deflection: Center line of pole at elev. of load (Ft.)	Deflection: Center line of pole at ground (Inches)	Deflection: Center line angle of deflection at ground Deg.	Deflection: Center line angle of deflection at ground Min.	End of Cross-arm (Ft.)	Angle of Twist of end of Crossarm Deg.	Angle of Twist of end of Crossarm Min.	Remarks
A	Pacific Coast Steel Co. Galvanized steel pole 24 in base tapering to 15 in. cage.	Pacific Coast Steel Co. Galvanized steel "earth" type footing, tapering to bottom of hole 8ft. 1in. below ground.	An 18 in. diam. auger hole 8ft 0 in. deep was dug by machine and trimmed by hand 3ft. 0in. square at top to 18 in. square at bottom.	Breast pull	750	1.06	1/8	0	18				
					1,500	3.85	3/4	1	06				Load slacked off.
					0	2.22	3/4	0	36				No sign of failure.
					2,200	7.56	1-7/8	2	47				Load slacked off.
					0	4.76	1-1/4	1	53				(Splices gave somewhat giving pole permanent set as a series of chords).
B	Same pole as A.	Pacific Coast Steel Co. 24 in. square steel stub structure set in concrete 7 ft. 6in from ground to bottom of hole.	A 30in diam. auger hole 7 ft. 6in. deep was dug by machine and squared by hand to 2ft. 8in.	Breast pull	750	0.59	0	0	06				Second test on this pole. (Before test began transit reading showed pole 6-1/2 in. out of line from first test. Bolt found loose and tightened.).
					1,500	1.36	0	0	30				
					0	0.50	0	0	12				
					1,500	1.44	0	0	12				
					2,250	2.10	1/8	0	36				
					0	0.79	1/8	0	12				
				At end of crossarm 5ft. 6in from center line of pole.	800	0.63	1/8	0	06	1.33	7	19	
					1,500	1.12	1/4	0	12	3.15	21	40	
					0	0.46	1/8	0	06	1.91	15	17	
					2,200	Not read	Not read			Not read			Compression legs failed just above bottom splice
D	Galvanized steel pole with 18 in. bottom tapering to 15 in. cage, designed by sub-committee and manufactured by Pacific Coast Steel Co.	Special steel earth type footing with 18in parallel sides. Set 8 ft. 0in below ground.	A 30in diam. auger hole 8 ft. 0 in. deep was dug by machine.	Breast pull	750	1.06	1/8						
					1,500	3.85	1						
					0	2.22	3/4						Deflection due largely to give in splices although pole showed some curvatures between splices.
					2,200	7.56	2-1/8						
					0	4.76	2-1/4						
C	Same pole as for Test D and E.	Special Steel earth type footing with 18in parallel sides. Set 8 ft. 0 in below ground. Differsfromtype D footing in details only.	A 30in. diam. auger hole 8 ft. 0 in deep dug by machine.	Breast pull	750	1.06	1/8	0	12				
					1,500	3.08	3/4	1	18				
					0	1.39	1/2	0	48				Before this test, transit reading showed pole 13-1/2 inches out of plumb from first test.
					2,200	5.53	1-1/8	2	41				
					0	2.82	1-3/8	1	42				
E	Same pole as for Tests D and C.	Steel Stub structure 18 in square set in concrete. 8ft.6in.from ground to bottom of hole.	A 30in diam. auger hole 7 ft. 6 in. deep was dug by machine. A collar 12 in. high above ground used, 24in. square.	Breast pull	800	1.05	1/8	0	12				
					1,500	2.27	1/4	0	42				
					0	0.75	1/4	0	24				Before this test transit readings showed this pole 15-1/2 inches out of plumb due to first two tests.
					2,250	4.35	1-1/4	1	36				
					0	1.87	1/4	1	00				
				At end of crossarm 5 ft. 6 in. from center line of pole.	750	0.75	1/8	0	12	1.91	12	11	
					1,500	1.73	1/8	0	30	4.98	36	13	
					0	0.13	0	0	06	3.07	32	19	
					2,250	Not read	1/8	0	24	Not read	Not read		Leg angles broke just above second splice. Compression leg buckled and tension leg pulled apart at bolt-hole just above splice. Failure occurred about 20 ft. from ground. Load was brought up but kept slackening off, but was taken up by pulling until failure.
F	Pacific Coast SteelCo. Galvanized steel polewithparallel sides giving 15in. square cross-section.	Concrete with steel stub structure of same section as pole. 8ft. 6 inches from ground to bottom of hole.	A 24in auger hole 7ft. 6in. deep dug by machine. A collar of concrete 12in. aboveground was used.	Breast pull	750	1.13	1/8	0	18				
					1,500	3.23	3/8	1	00				
					0	1.65	1/8	0	42				
					2,200	6.17	1-1/8	1	53				
				At end of crossarm 5 ft. 6 in. from center line of pole.	0	3.45	1/4	1	18				
					750	0.99	1/8	0	06	2.02	10	48	
					1,500	2.20	1/8	0	30	5.22	33	18	
					0	0.29	1/8	0	00	3.09	30	36	
					2,250	3.92	1/4	0	54	8.42	54	54	
					0	1.20	3/4	0	18	5.15	45	54	No twist in foundation occurred and practically no twist in riveted cage.

four types of steel poles so that comparison of earth and concrete footings under load could be had as well as a comparison of the behavior of the poles themselves under load. Unfortunately only one pole of each type was available. Breast pulls only were made on the earth-type footings to avoid damaging the poles. Comparable breast pulls then were made on the poles after transferring them to the concrete footings. Lastly, torsional loads were applied to the poles at the ends of the crossarms, the poles remaining on the concrete footings.

Three poles were donated by the Pacific Coast Steel Company. Two of these followed a tentative design of the subcomittee, and the third pole was designed by the steel-company engineers. Figs, 1, 2 and 3 cover the general details of these poles and their various footings.

The holes for the footings were bored by a machine auger and trimmed by hand where required. The soil was damp alluvial loam and was rather soft. All backfilling was carefully done around the earth-type footings. The concrete footings were poured solidly against the holes and required no backfill.

The load was applied through a ½-in. steel cable which ran through two snatch blocks, one supported on a double-pole guyed structure and the other chained to a spur track. The pull on the test poles was almost horizontal. A winch mounted on a motor truck provided the load. Load readings were taken with a 10,000-lb. capacity Chatillon dynamometer which was calibrated both before and after the tests. After pulling up each load the line was shaken and the block friction practically equalized.

After each 1,500-lb. load was reached the line was slackened and the permanent deflection recorded. The same procedure was followed with the 2,250-lb. loads. As the poles were designed for a working load of 1,500 lb. the deflections for this load were of special interest.

Several conclusions can be made from these tests:

1—Fabricated poles can be designed very closely once the loading data are given.

2—Steel poles set in earth will obtain a considerable amount of relief from broken-wire stresses by the yielding of the foundation, acting in this respect like wood poles. The only drawback is

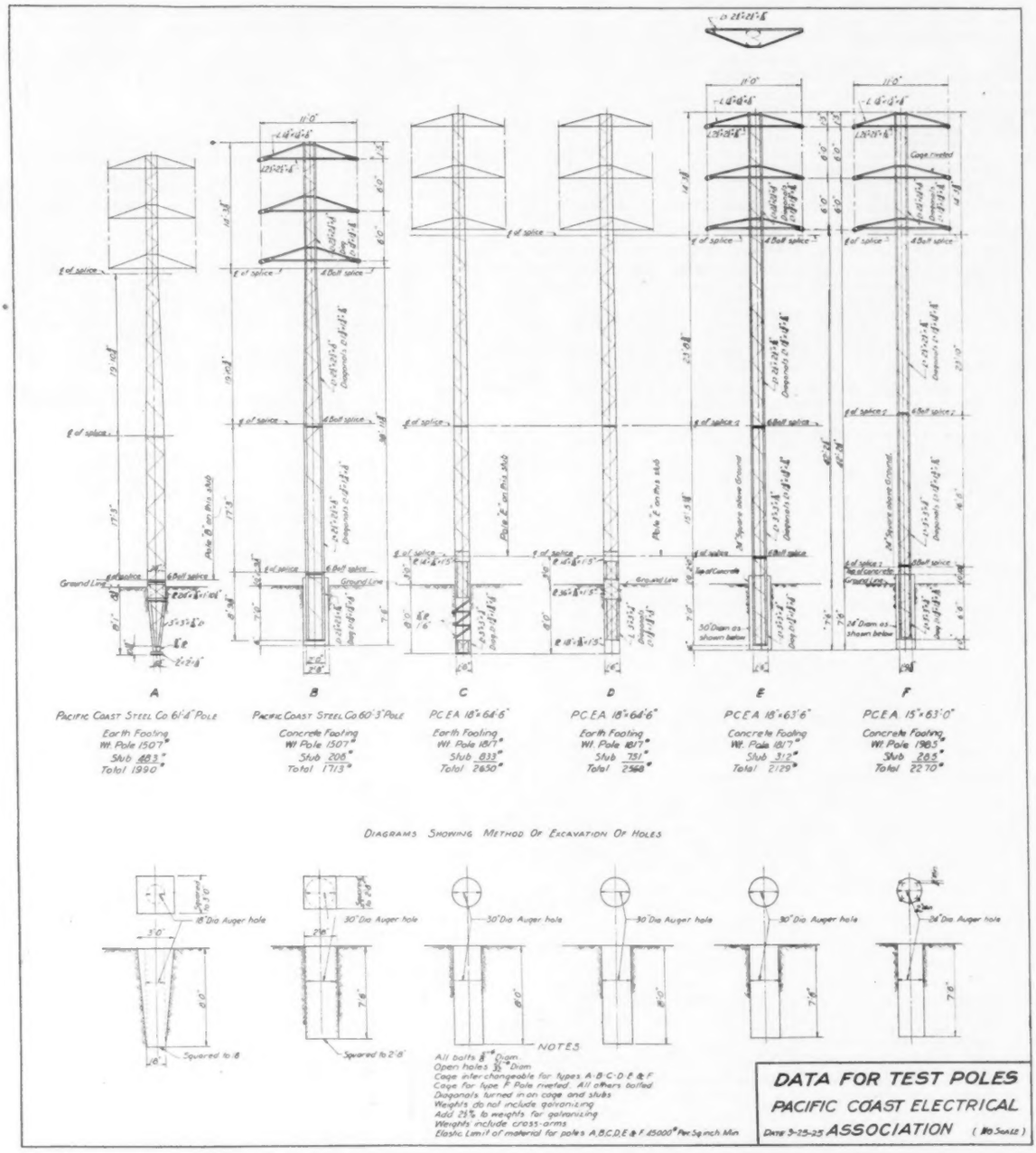


Fig. 3. General specifications and arrangement of steel poles for tests staged by steel pole subcommittee.

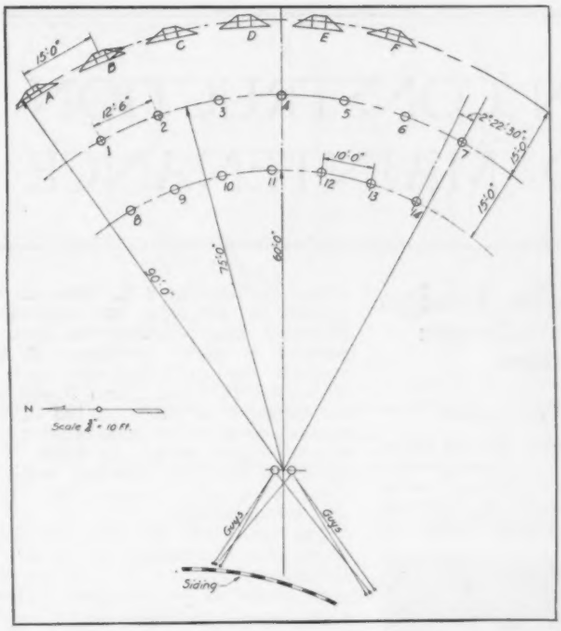


Fig. 4.- Plot plan of testing grounds.

that the deflection is appreciable under working loads so that the poles become tilted. It is probable that in the case of the Davis tests this was due largely to the softness of the ground which was quite damp.

3—Steel poles of this type even when set in concrete have quite an elastic deflection which affords stress relief in case of broken wires. At a working load of 1,500 lb. the pole is nearly perfectly elastic when proper allowance is made for the deflection of the foundation.

4—As a result of the tests it is recommended that batten plates be used at the leg splices. This feature is incorporated in the design of the pole.

Suggestions

In conclusion it is desired to state that the subcommittee has striven toward such a design for steel poles as will be readily applicable to various loading conditions, with the smallest possible number of changes in the detail of the pole itself. The various loading conditions of Pacific Coast power companies are appreciated fully. With this in view loadings were selected which were believed to serve the greatest number under California conditions. Thus if the design meets with the general approval of the power companies only slight modifications in the way of material to be used will be necessary to meet almost any condition that may be desired.

Foundations for the steel poles tested under this report have been allowed to remain in the Davis construction yard of the Pacific Gas and Electric Company, and it is suggested that further investigations

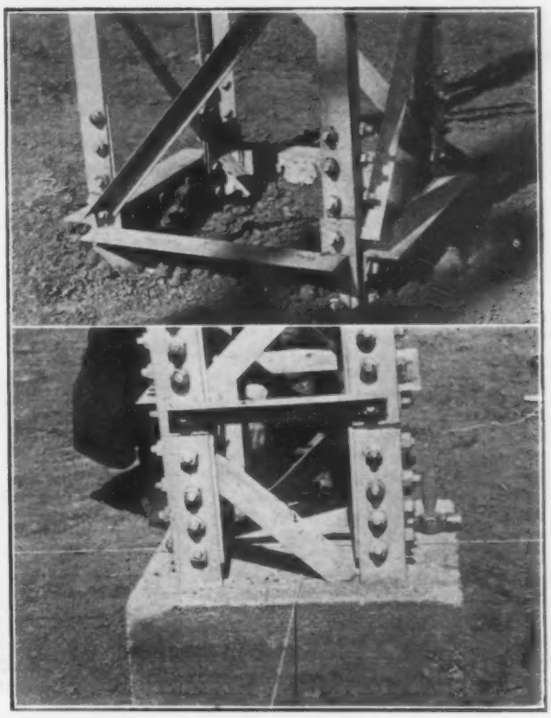


Fig. 5. Above, earth footing after 2,250-lb. breast pull, test A. Below, result of 2,250 lb. pull at end of crossarm. Earth was damp in both cases.

be continued by the 1926 subcommittee, making use of the seasoned foundations to obtain results comparative with those taken by this subcommittee some ten days after the foundations were placed. No doubt there are many questions that will arise respecting this design and it is with this thought that the suggestion is made for a continuance of the subcommittee's work for another year.

Editor's Note.—The second part of this report, covering tests on wood poles, will appear in an early issue of the Journal of Electricity.

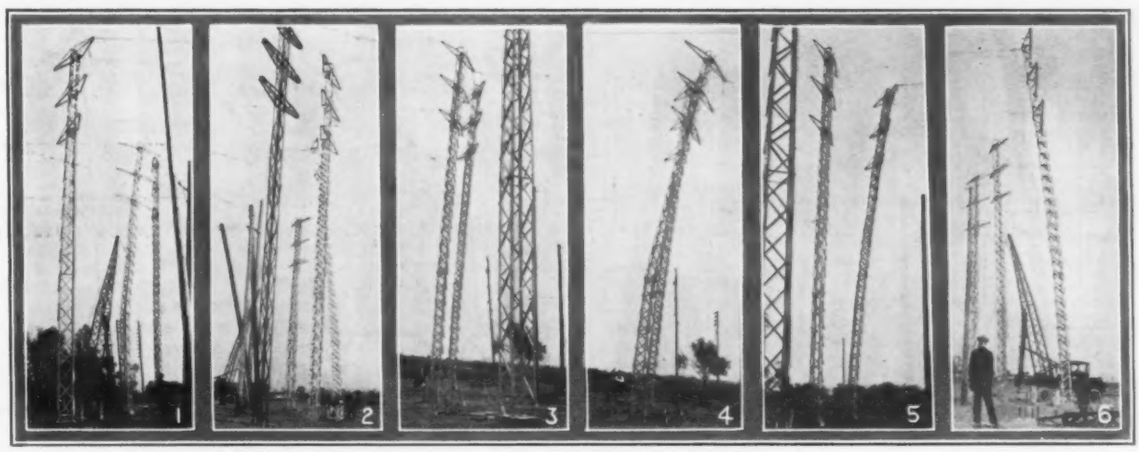


Fig. 6. Steel-pole tests. (1) Test B, failure at 2,200-lb. pull on crossarm. (2) Test D, 2,250-lb. breast pull. (3) Test E, permanent deflection after 1,500-lb. breast pull. (4) Test E, failure at 2,250-lb. pull on crossarm. (5) Test F, 2,250-lb. pull on crossarm. (6) Test F, 2,250-lb. breast pull.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Penstock Manifold for Pit 3 Is of Unique Design

Maximum Hydraulic Efficiency Effected by Mass-Concrete Manifold Which Also Fits Physical Conditions

By CLINTON DE WITT, Assistant Engineer,
Division of Civil Engineering, Pacific Gas and Electric Company, San Francisco.

Penstock-manifold construction at the Pit River No. 3 plant of the Pacific Gas and Electric Company is noteworthy particularly for its large size and low hydraulic losses.

This manifold is esentially a massive concrete block in which the upper 40 ft. of the three 10 ft. 9 in. penstocks is encased. The three circular penstock sections connect to three gently warped passageways about 22 ft. long which change their shape gradually until they merge into a single 19 ft. circle. The manifold is immediately above the power house at the lower end of the 4-mile concrete-lined circular tunel.

The three penstocks are folded together at their upper ends so that their center points lie approximately at the corners of an equilateral triangle. This arrangement permits a simpler and less violent transition from the three circles to the single large circle than any other method of joining. The middle pipe is raised and the two outer pipes are brought in underneath the middle pipe. A minimum distance of 3 ft. in the clear between pipes was maintained to obtain thicker and stronger transition or partition walls in the taper section than otherwise would be possible. This is shown in Fig. 1.

Hydraulic pressure inside the manifold ranges from 80 to 100 lb. under static conditions. Great circular rings of reinforcing bars completely surrounding the three pasageways resist this expanding pressure. In addition, the transition or partition walls are

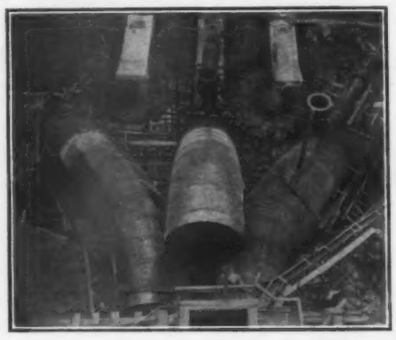


Fig. 1. Looking down upon the three penstock pipes showing their triangular arrangement at the manifold site. The standpipe connections, two of which are complete, are shown also. The first 40 ft. of these pipes subsequently was encased in a solid concrete block.

reinforced for a differential of pressure between any two passageways.

The transition section from the single 19-ft. circular section to the three 10 ft. 9 in. circular section was maintained at practically constant area. Sections at 2 ft. intervals were plotted in the office and dimensioned in detail, thus enabling the form carpenters to make templates at these sections for their interior formwork Reference to Figs. 2 and 3 will show the changes in shape at the different contour points and the relative location of each point. In spite of the rather elaborately curving walls the form work was comparatively simple and inexpensive.

For the lower two pipes deviations from the theoretical transition sections were required to permit a sluice pipe intake to be installed. Troughs were formed gradually along the floor of these pipes, as indicated in Fig. 3, and gradually dropped and merged together so as to discharge into a 24-in. sluice pipe. The sluice pipe carries debris to a sluice trap and finally discharges into the main waste pipe from the surge chamber. Any debris carried along the floor of the tunnel will drop into this sluice pipe and thus be prevented from going through the turbines.

The upper butterfly valves controlling the penstocks are located just in front of the main block of concrete of the manifold. A concrete house for the protection of these valves extends the full width of the manifold block and forms an integral part of it.

The standpipes which protect the penstocks from collapse upon sudden closure of the butterfly valves rise from the top of the manifold block and are set into the solid concrete of the block. Connection between the standpipes is through the smaller curved pipes, two of which are shown

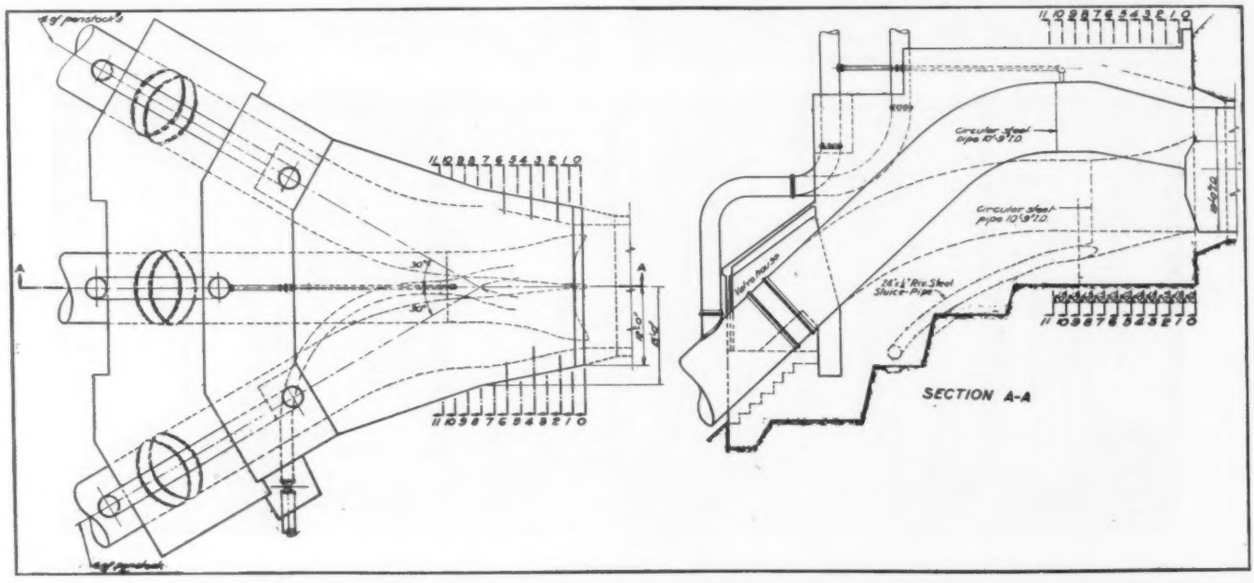


Fig. 2. Plan (left) and central vertical section (right) of penstock manifold and block showing the relative arrangement of the three pipes and indicating (right) the locations of the contour sections shown in Fig. 3.

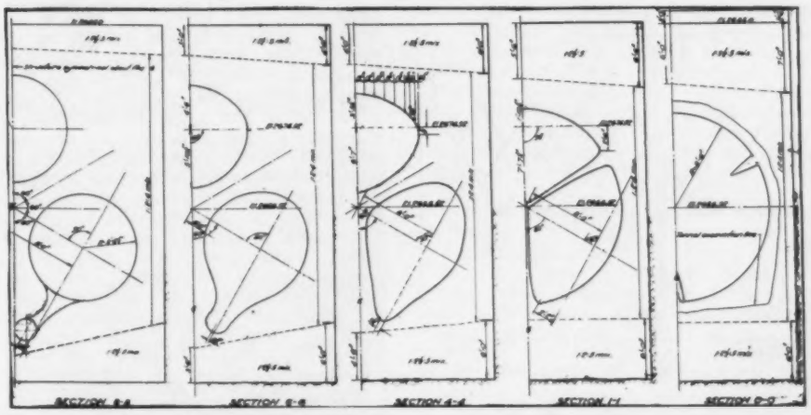


Fig. 3. Five progressive sections showing (from right to left) the smooth transition from a single circular section to three circular sections and showing also the method of dropping the sluice trough. This transition is accomplished in formed concrete.

in place in Fig. 1 and all of which are indicated at the left in Fig. 2.

The entire manifold block acts as the upper anchor for the penstocks for both vertical and horizontal thrusts. The concrete mix was varied to give most strength where needed. The sections below and above the pipes are of 1:2½:5 mix while that actually encasing the pipes is 1:2:4 mix.

The very large size of the tunnel and penstocks and the head under which they operate made the design

Fig. 4. Interior of tunnel looking toward manifold showing smooth transition.

of the ordinary "Y" or branching type of manifold very difficult structurally. This latter type unless embedded in reinforced concrete block requires through-bolts to resist the hydraulic thrusts. Through-bolts cause hydraulic disturbances and vibrations and result in considerable head-loss in fast-moving water.

As the Pacific Gas and Electric Company spent about $13,000,000 for this plant with a 315-ft. static head it may be seen that each foot of head may be capitalized roughly at $44,000. For this reason types of construction giving the smoothest flow and least head loss are the most desirable if first cost is not unduly excessive.

The type of manifold chosen has a practically negligible head loss except for the sluice-pipe troughs. These troughs are required for any type of manifold chosen and any loss resulting from their presence would be common to all types. The taper of the transition is most gradual. No obstructions or sharp changes of line are present.

The amount of concrete in the manifold block is not greatly in excess of the quantity required to resist the forces acting on it in its capacity as the anchor for the upper ends of the penstocks. This means that the concrete yardage could not be lessened greatly, regardless of the type of manifold used.

The ensemble structure has a pleasing appearance particularly when viewed from the power-house flat below. Results are entirely satisfactory.

Power Company Communication Systems—III (a)

Maintenance of a High Degree of Insulation Proves to Be Secret of Overcoming Operating Difficulties

By H. N. KALB*, Telephone Engineer, San Joaquin Light & Power Corporation, Fresno.

Eternal vigilance is the price of good service in any line, and power company telephone lines are no exception to this rule. This fact applies not only to the electrical and mechanical parts of the system but applies as well to the human element in the use and operation of the system. It is true that if no trouble occurs at a station or substation for a long period of time the operator will fail to do his part as efficiently as he has done it when he has been experiencing an appreciable amount of trouble right along. In other words, practice makes perfect in this as well as in other fields of endeavor. Hence to make an attendant more proficient, at intervals he should go through the operations as nearly as possible in the same way as he would if or when caring for trouble. This will keep him "on his toes." Under this system, when trouble does come, the operator will act not from memory alone nor from habit alone but from a co-mixture of these, together with the assurance that he has gained through experience with his apparatus. Self-confidence in the handling of equipment and particularly communication equipment in times of trouble will expedite matters in a valuable degree.

Repairing and adjustment of telephone equipment should not be fostered or even permitted except in certain specific cases and then only in accordance with written instructions. Telephone apparatus is comparatively delicate and should be cared for by one who not only well knows how but who is progressive and in good practice. Telephone maintenance is accomplished best by a man, or men as the case may be, who covers the entire system or a designated part of it, and who visits all installations of communication equipment checking and testing all instruments and auxiliary apparatus. All spark gaps should be inspected regularly to insure their proper spacing and cleanliness; all fuses should be inspected to ascertain that they are of the proper rating and firmly held in the clips; windings of induction coils, receivers, bells, relays and other devices should be tested to assure that no part of them is shorted or grounded; resistance of the transmitter button should be measured and the condition of all batteries ascertained. All switches should be inspected periodically to make sure that they are in operating order and make good contact. No dust or cobwebs should be allowed to accumulate.

The testing of windings and circuits can be made best with a resistance meter. The San Joaquin Light & Power Corporation uses a Stewart "Detecto-meter" supplied by the Kel-

Fig. 20. The "Detecto-meter" which facilitates the testing of telephone circuits and windings.

logg Switchboard & Supply Company. This instrument is shown in Fig. 20. The calibration is directly in ohms on a scale similar to the scale of an ordinary voltmeter. This instrument also may be used as a d.c. voltmeter. Experience proves that with this portable instrument resistance values can be checked very rapidly. Results are a great aid in maintenance work. Normal procedure is to make a list of readings as they should be when the equipment is in first-class condition and to check subsequent readings against this standard list. It takes a man but a short time to memorize this list of readings, and the work itself consumes but little time.

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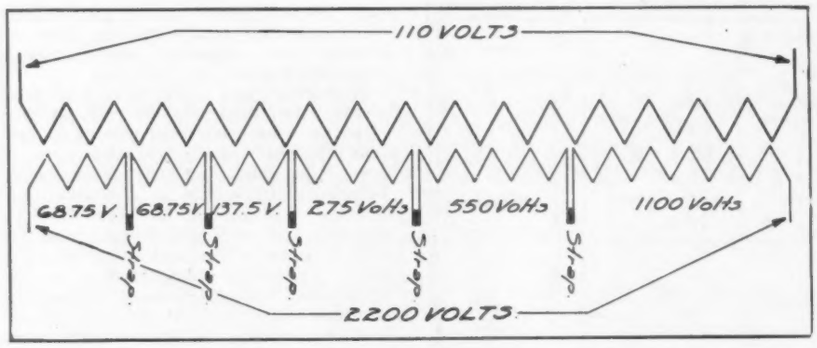


Fig. 21. Schematic wiring diagram for a special dry-type transformer for high-voltage tests on telephone equipment.

All wiring in conduits and not protected by insulating transformers is subject to severe over-voltage duty and should be rubber-insulated. As rubber deteriorates rapidly it is well to test such wires about once in two years. This test is performed best by the use of a 110/2,200-volt dry-type transformer. This transformer should have several taps on the high winding so that 2,200, 1,100, 550, 225, and 112.5 volts may be obtained when using 110 volts on the low winding. In making the aforementioned insulation tests the 110-volt winding should be connected to the 110-volt supply of the station and the 2,200-volt windings connected to the wires to be tested. It is necessary to test between wires as well as to test between wires and ground or the conduit itself. In passing it is well to say here that all conduits should be grounded positively. The testing transformer should be fused on the low-voltage side with a 1-amp. fuse. This will obviate trouble in event of break-down of wires under test.

Line troubles on power-company telephone lines are about the most difficult to locate of any kind of trouble. Telephone lines are constructed to carry the extremely small output of the telephone instrument, but are subjected continually to the varying influence of adjacent power conductors which carry heavy currents at high voltages. As long as the communication line and connected apparatus are well insulated from ground and the exposure to power wires, of each wire of the telephone circuit is exactly the same; the size of each wire of the telephone circuit is the same; the insulation to ground of each wire of the telephone circuit is the same; and each wire of that circuit is of exactly the same material and has the same joints or splices—just so long will good conversation with little interference from noise be possible over the line. If these conditions are satisfied, good conversation will be possible even though the voltage of the telephone line to ground may be high. It should be remembered that this is the whole secret of good service over power-company telephone lines when power trouble is being experienced. There may be but little potential to ground from the communication circuit under normal conditions, but when trouble occurs on the power circuits adjacent there may be high voltages to ground that may break down inadequate equipment just when good telephone transmission is of more than usual importance.

A good 2-kv. insulator such as commonly used on 2.3-kv. distribution circuits should be used as a line insulator, and once such an insulator is adopted it is best to use nothing else. It must be remembered that the insulation to ground of each wire not only must be good, but it must be the same. To put this in other words, the leakage to ground from each telephone conductor of the circuit must be the same. If the exposure of each wire of the circuit to adjacent power wires is not the same, the wires will not have the same voltage to ground and a circulating induced current will result. This in turn will cause a noisy line. If the two wires of the communication circuit are not the same size and of the same material their exposure will not be the same and their conductivity will be unequal. Both of these will tend to unbalance the line. Poor or non-uniform joints also tend to cause line unbalance and must be cared for. It is well to remember that each telephone wire acts as one plate of a condenser and the power wires taken as a whole act as the third plate of this same condenser. Thus a split or balancing condenser is formed of which the power wires, acting as one condenser plate, are the charging source. If both of the telephone wires are exposed equally to the power wires, each will receive an equal charge of the same polarity at the same instant. This will result in no interference, other things being ideal. The only result will be a balanced voltage between both of the wires and ground. However, if the leakage of one telephone wire to ground is greater than that of the other wire of the same circuit, there will be an unbalanced voltage to ground and a circulating current in the line and attached instruments resulting in noise and consequent interference. The effects discussed in this paragraph are only from electrostatic induction or the induction due to the impressed voltage on the adjacent power wires and bear no relation whatever to the amount of power current flowing in the power line.

Electromagnetic induction is another source of induced currents in telephone lines. In this case the induction is caused by and is proportional to the amount of current flowing in the power line. The relation between the two lines in this case is that of the two windings of a transformer having an air core. The power wires act as the primary and the telephone wires as the secondary of this transformer. Both of them are in a common and fluctuating electromagnetic field, with the result that a current is induced in the telephone circuit. This action between lines induces a voltage in each of the telephone wires of the circuit, the polarity of which is the same at any instant. Further, if the exposure of the two telephone wires is the same, the voltages induced in the wires will be equal. As before, the presence on the telephone line of this potential to ground will cause no interference, other conditions being ideal. And again if the leakage of the two wires of the circuit is not the same an unbalanced condition will prevail, causing a circulating current and a noisy line.

Editor's Note.—This is the first half of the third and last of Mr. Kalb's series on communication systems for power companies. The closing installment will appear in the next issue.

Some Interesting Northwestern Line Construction

By J. E. YATES, Assistant Chief Engineer, Pacific Power & Light Company, Portland.

Recent transmission-line construction of the Pacific Power & Light Company, Portland, Ore., has included two lines of special interest: The Hanford-Taunton (Wash.) line, to effect a second connection with the system of The Washington Water Power Company at Taunton, and the Pomeroy-(Wash.) Lewiston (Idaho) line, to connect the newly acquired Lewiston property with the company's existing Yakima-Walla Walla (Wash.) system. This latter line also provides a third connection with The Washington Water Power Company through its tie line from Moscow to Leon Junction, Idaho.

The Hanford-Taunton line is 15⅓

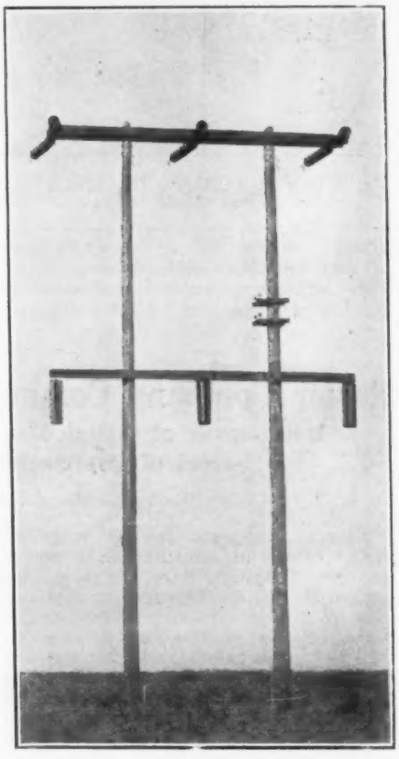


Fig. 1. Angle structure in the Hanford-Taunton 110-kv. line of the Pacific Power & Light Company. An extra crossarm and three strings of insulators are stored at this and several other points along the line.

miles in length and operates at 110 kv. The country traversed is fairly level and no particular construction difficulty was encountered. Standard H-frame towers were used. Each tower is composed of two 55-ft. wood

Fig. 2. An indication of the roughness of some of the country traversed without special equipment.

poles spaced on 11-ft. centers and a 23-ft. crossarm. These towers are placed about 500 ft. apart. Number 1/0 7-strand copper conductors are suspended on 6-unit string of Westinghouse 10-in. disc insulators hung on 11-ft. centers. The high-line telephone of No. 8 solid, extra-high-tensile strength, copper-weld wire, is supported on a 2½-ft. crossarm mounted on one of the poles 14 ft. below the high-tension crossarm.

Leaving Hanford to proceed north to Taunton, the line crosses the Columbia River necessitating a span of 2,726 ft. The design of the crossing span was simplified, however, by the existence of an island in the river on which could be erected a supporting tower between the strain towers on either shore. This made the unsupported spans 1,074 ft. from the south shore and 1,652 ft. from the north shore. This advantageous situation, coupled with other determining factors, led to the choice of wood instead of steel for the towers carrying the crossing. Three 4-pole towers were designed for the purpose. The elevation of the banks and the island made necessary the use of 65-ft. poles on the south bank, 120-ft. poles in the center supporting tower and 95-ft. poles on the north bank to produce a graded line with a minimum clearance over the river of 60 ft. The ½-in. conductors used in the growing span are extra-high-tensile-strength stranded copper-weld steel wire.

The 66-kv. Pomeroy-Lewiston line, 29½ miles long, presented a more difficult construction problem because of the extremely rough country traversed by a portion of the right-of-way. The absence of roads along the route made it necessary to drive the truck across country. As indicated in one of the accompanying illustrations, a number of difficult grades were encountered. This line is carried throughout most of its length on Locke pin-type insulators on a single line of 45-ft. wood poles set on 250-ft. centers and with triangular configuration. At angle and strain points strain insulators suspended from H-frame towers carry the 1/0 stranded copper conductors. H-frame construction also was used over a portion of the rough country where spans as long as 600 ft. were desirable.

Because of the rocky formation of the ground most of the pole holes had to be "shot." To expedite the drilling an Ingersoll-Rand portable, gas-engine-driven compressor with a capacity sufficient for two guns was utilized. This compressor equipment was mounted on wheels so that it could be drawn behind a truck. In the case of some hole locations, however, the compressor could not be brought close enough to reach the pole site with the air lines. Such holes had to be drilled by hand. Wherever possible the poles were raised by an auto pole-derrick.

Here again the rough terrain hampered operations in some sections to the extent that a number of poles had to be raised by hand after having been snaked to the hole by motor-truck power applied to lines strung through snatch blocks.

The raising equipment mentioned above consists of a 2½-ton truck over the rear axle of which is mounted a 30-ft. A-frame derrick so hinged that its top can be swung clear of the truck bed at any desired angle. A hoist is mounted on the forward end of the truck bed and is run by the truck engine.

On this job the company's portable camp outfit was used. One unit of this outfit consists of an office tent, a mess tent and three bunk tents mounted on wagon beds so that they can be drawn by horses or behind trucks. Such a unit accommodates 28 men. It was found practicable to move

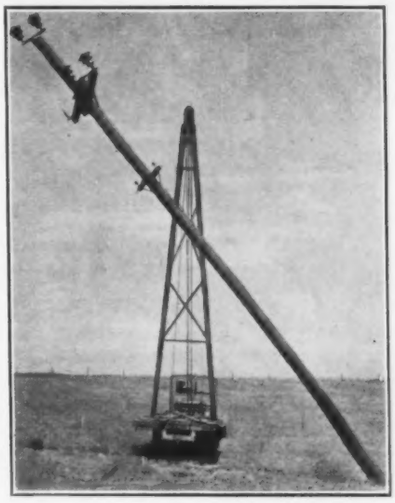


Fig. 3. Setting poles in the 66-kv. Pomeroy-Lewiston line with a derrick mounted on a GMC truck.

camp about every six miles, working three miles in each direction from each camp location. C. S. Knowles, superintendent of construction for the company, built both of these lines.

This line construction, coupled with certain other rebuilding and maintenance work accomplished during the past year, is part of a large program intended to improve service on the company's system. Begun four years ago, this program will continue through 1926 when the present plans will be completed. Then there will be a comparatively new 66-kv. transmission line of 1/0 copper from the Naches generation station west of Yakima through Pasco, Walla Walla and Pomeroy to Lewiston. Much of the old line between Yakima and Pomeroy has been rebult and there remain only two sections to be completed during 1926. Some of this line was built as early as 1905 and used small poles and aluminum conductors. These two sections are between Prosser and Richland Junction and between Dayton and Tucannon.

Tests of Turbine Governor Made at Seal Beach Plant

The installation of a new type of governor on the new 48,000-hp. turbine at the Seal Beach plant of the Los Angeles Gas and Electric Corporation by the Westinghouse Electric & Manufacturing Company is proving highly satisfactory in the prevention of overspeeding on the part of the turbine when the generator loses its load.

Several tests were made to determine whether or not the governor would perform as expected. At 8:30 on the night of Dec. 8 the main oil switch at the Seal Beach Station was opened, which meant the dropping of 20,000 kw. load, which the turbine at the station was carrying, on the Alameda Street Station. At 7:22 p.m. on Dec. 9, a load of 31,000 kw. and at 8:23 on the same evening a load of 39,000 kw. was dropped on the Alameda Street Station. The new governor held the speed of the big turbine at Seal Beach well within safe limits, and the operator was able to synchronize it with the system again in about two minutes. The Alameda Street Station picked up all of these loads without any of the more than one hundred thousand consumers knowing that anything out of the ordinary had happened.

The last test was made on the evening of Dec. 11 with A. B. Day, vice-president and general manager, and several Westinghouse officials present. At this time a load of 35,000 kw. was dropped and the Seal Beach Station was back on the line in one and a half minutes, Alameda Street Station picking up the load without any disturbance to the system.

Motor-driven pumps are overcoming one of the most serious handicaps to successful cotton-raising in Mexico. The Laguna territory comprising some million acres of fertile land near Torreon in central Mexico has been found to be even better adapted to cotton culture than are our Southern states with the exception of the erratic natural water supply. This difficulty has been and is being overcome by tapping the underground storage reservoirs through the use of electric pumps. Central generating stations, operating at 2.4 kv., 60 cycles, are being installed at convenient locations and lines strung from these to the pump sites. Most of the pumping equipment operates at 440 volts. The depths of the wells varies from 50 to 350 ft.

IDEAS FOR THE CONTRACTOR

Electrical Advertising—Its Forms and Design—IV

Floodlighting, Outline Lighting and Some of the Methods of Designing Less Simple Exposed-Lamp Signs

By C. A. ATHERTON, National Lamp Works of the General Electric Company

5. Building Displays—Floodlighting

A building that is suited to it should be floodlighted by means of one or more groups of projectors. The principal problem is to find suitable locations for the projectors and to determine their number and size.

It is usually found to be easier and less likely to cause glare from stray light when the projectors are concealed at points below the wall or building face that is to be illuminated, but above the heads of the passersby. However, the location of the projectors should also be carefully studied with a view to the shadow effect. Most architecture is designed around the shadows from the sun. The improper location of the lighting units may cause grotesque inverted effects. For building faces which reach down to within short distances from the ground, the projection distance should not be too great, as very narrow, high intensity beams of light are visible because of the dust and moisture in the air. These bright streaks of light attract attention to the projectors rather than to the building.

It frequently happens that the only possible location for the projectors is on a ledge, balcony, or marquee of the building which is to be lighted. The latter usually gives considerable flexibility in working out the lighting, but from the narrower ledges and balconies smooth lighting will not result. There may, however, be vertical lines, such as columns, which may be brought out, or streamers of light crossing at angles with the lines of the architecture may in some instances be found desirable. Pools of light may be introduced at various points in effective manner. Artistic use of colored light in this way is especially effective in adding depth and interest to a structure. With color it is especially important to provide the additional wattage necessary to bring up the brightness to levels comparable with that from clear lamps.

Rules for Floodlighting Installations

The following rules for determining the proper number and size of projectors will hold for all ordinary floodlighting installations.

a. Use from 2 to 20** (or more) watts per square foot of surface to be illuminated, depending upon the following:

The color of the surface; if it is white, it requires less wattage than it does if it is colored.

The shape of the surface; if it is irregular, so that a great deal of light spills out into the air, it requires a larger wattage.

The efficiency of the projectors; if they are to be located at a great distance and consequently are shaped so as to confine the light within a narrow angle and therefore utilize a smaller proportion of the light from the lamp, the display will require more wattage per square foot.

The brightness of the district; if there are other bright objects near by, it requires more wattage.

The color of the light; blue and green light require much more wattage than do orange and yellow and these require more than does uncolored light.

SUMMARY

Principles of Sign Design

Factors to be Determined	TYPE OF SIGN		
	Exposed-Lamp Signs	Enclosed-Lamp Signs	Silhouette Signs
Best Ranges of Effectiveness	250 ft. — to several miles	Up to 500 ft.	Up to 1,000 ft.
Letter Height (in feet) This quantity determines the maximum legibility distance.	$H = \frac{\text{Greatest Viewing Distance (ft.)}}{250}$	$H = \frac{\text{Greatest Viewing Distance (ft.)}}{300}$	$H = \frac{\text{Greatest Viewing Distance (ft.)}}{350}$
Lamp Spacing (in feet) This factor determines the smoothness of illumination	$S = \frac{\text{Shortest Viewing Distance (ft.)}}{1{,}000}$	Lamps spaced not more than 6 inches apart in any direction	Lamps spaced on 6-inch centers
Number of Lamps	$N = \frac{H}{S} \times \text{No. of Letters} \times 2\frac{1}{2}$	$*N = \frac{WH \times \text{No. of Rectangles}}{40}$	Depends upon actual size

	District Brightness	Lamp Wattage***	Lamp Wattage	Lamp Wattage
**Lamp size	1	75-100	60-75	100
	2	75	60	75
Obviously	3	50- 75	50-60	75
the brightness	4	50	50	60
of the display	5	20- 50	50	60
is influenced	6	20	40-50	50
by this factor.	7	15- 25	40	50
	8	15	40	40
	9	10- 15	25-40	40
	10	10	25	25

* See page 460, Journal of Electricity, Dec. 15, 1925

** See note page 459, Journal of Electricity, Dec. 15, 1925.

*** For distances which exceed one mile, use this formula:

$$\text{Lamp Watts} = 10 \frac{\sqrt[3]{\text{Greatest Viewing Distance}}}{\text{District Brightness factor}}$$

b. Make the top of the building brighter than the bottom.

c. Conceal the projectors and locate them so that no part of the beams can possibly strike the eyes of people on the streets.

d. The choice of the size and angle of the beam of the reflectors depends upon the size of the surface to be illuminated and the distance from the surface to the reflectors. The dimensions of the ellipse of light resulting from a given distance, angle or incidence and angle of beam may be obtained from tables supplied by the manufacturer of the projector. The area of the ellipse should be a small part of the surface to be illuminated; every part should receive light from more than one projector so that streaks in the individual beams may be eliminated and the outage of a unit will leave no area dark. The standard (and most commonly used) units employ 250, 500, and 1,000-watt Mazda C lamps.

6. Building Displays—Outline Lighting

For exposed and enclosed-lamp building displays the rules of sign design hold good. A slightly lower order of brightness is sometimes employed.

In outline lighting the lamp spacing is often determined by the building architecture (See Fig. 5 A-B). Sometimes, however, a metal strip carrying the sockets and wires is fastened on the outside of the building face. In this case, and wherever the lamp spacing does not have to conform to the building architecture, it should be as follows:

Lamp Spacing for Building Outline Lighting

$$S \text{ (In feet)} = \frac{D' \text{ (In feet)}}{500}$$

The proper size of lamp for building outline lighting should be the same as that which is used under similar conditions for an exposed-lamp sign except that much more frequently the lamps are placed in eye-level positions and should on all such occasions have diffusing bulbs. The proper lamp size may be determined from the following equation:

Lamp Watts— Building Outline Lighting

$$\text{Lamp Watts}^* = 10 \times \frac{\sqrt[3]{D'' \text{ (In feet)}}}{\text{D.B.F.}}$$

For Further Study

It is, of course, imposible to discuss all of the phases of such a very great subject as electrical advertising in such a short article, so it is necessary to refer the reader for such subjects as color, its psychological effects, uses, etc., flashing and other motion, and all such specialties as the line of small show window signs, show case novelties, monogram, and carriage call signs, etc., to the more complete treatise on this subject under the title of "Electrical Advertising" by C. A. Atherton (Signs of the Times Publishing Company, Cincinnati).

DESIGNING LESS SIMPLE EXPOSED-LAMP SIGNS

There is a basic method of design for all exposed-lamp signs. The approximate rules as given previously apply only to simple patterns such as standard block letters. For all other patterns, to assure any degree of accuracy in the predetermination of the final appearance, a more accurate method must be used.

This method consists of calculating the size of the spots of light from the lamps for a given viewing distance under the existing conditions, then making a scale drawing using spots to represent the lamps in the sign, and examining the sketch at a distance proportional to the actual viewing distance desired. Two principal determinations are necessary, the size of the sign and the lamp spacing. The greatest distance at which a sign must be legible defines the size; the shortest distance at which the sign must have a good appearance determines the lamp spacing.

* See note on page 459, Journal of Electricity, Dec. 15, 1925.

Unfortunately the calculation of the exact size of a spot of light from a lamp (which affects both sign size and lamp spacing) is a rather complicated procedure. The spot size depends upon the distance to the observer, the atmospheric conditions, the candlepower of the lamps in the direction of the observer, the nature of the reflecting surfaces behind the lamps, the brightness of the district, and the proximity of other bright objects in view.

Effect of Irradiation

If the lighted filament of a single clear lamp, for example in a sign letter of trough construction, is viewed from a distance of three feet, it appears only a little larger than the unlighted filament. As the observer walks away from the sign, however, the filament parts seems to coalesce into a ball of light which increases in size until it entirely fills the bulb, and then keeps on expanding as the distance increases until it appears larger than the trough itself and finally, if viewed from a distance of a mile, the spot will actually appear about five feet in diameter.

This phenomenon, by which bright objects appear larger than dark objects of the same size, is known as irradiation, and is characteristic of the functioning of the eye. The eye, because of its construction, cannot resolve objects which subtend angles of less than one minute of arc; if details lie closer together their images strike the same unit of the retina, which is then stimulated as though only one image fell upon it. However, although not resolvable, the object may still be visible for a great distance because of its brightness. Thus a light source of one candlepower may be seen for 1.7 miles. The filament of a sign-lamp, when viewed from a distance of, say 30 feet, may form an actual image on the retina somewhat smaller than the area of one unit of the retina. As the viewing distance is then increased, the actual image becomes smaller and smaller, but the recorded visual impression remains constant in size. Meanwhile the visual impression made by other elements of the sign, such as

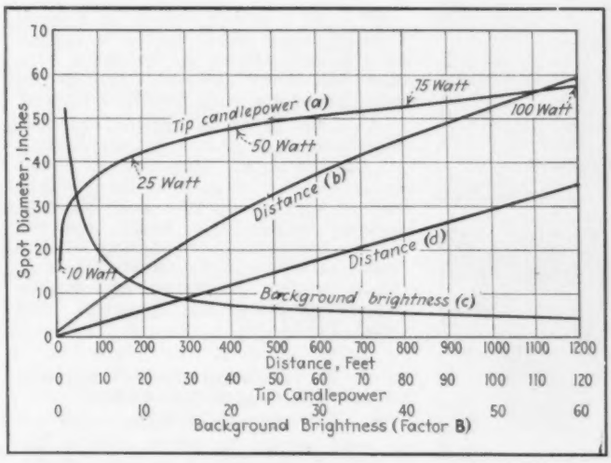


Fig. 26—Apparent spot sizes for an isolated lamp under different conditions.
(a) Distance = 1,000 ft. Absolutely black background. Varying tip candlepower.
(b) Tip candlepower = 81. Absolutely black background. Varying distance.
(c) Tip candlepower = 81. Distance = 1,000 ft. Varying background brightness.
(d) Minimum angle of differentiation.

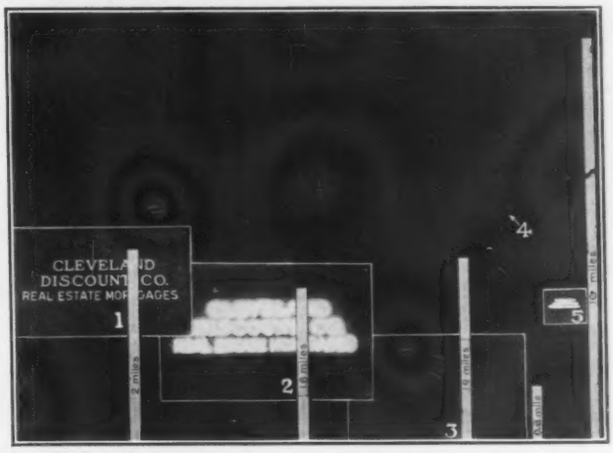


Fig. 27—1. Legible at two miles and no irradiation. The atmosphere exactly balances the irradiation effect. This atmospheric condition produces the theoretical maximum legibility distance.
2. The sign at 1.6 miles in clear air. The effect of irradiation is apparent.
3. The sign at 1.9 miles in a light haze.
4. The sign at 0.6 miles in a heavy haze.
5. The sign ten miles away in a clear atmosphere. The sign can be seen but is not legible.

the separation between lamps or letter strokes which subtend a larger angle, gradually become smaller, and presently the spot of light from a single

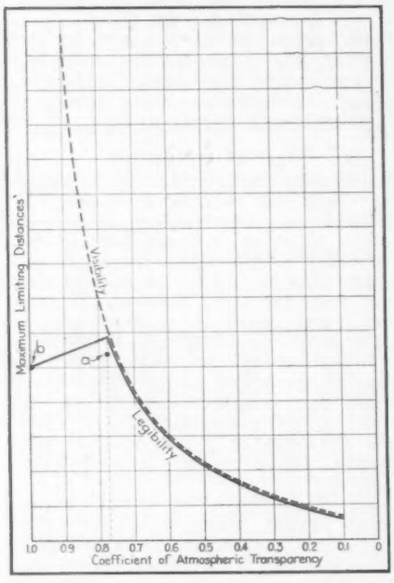


Fig. 28—The effect of atmospheric absorption is at first to increase the maximum legibility distance and as the atmosphere grows thicker to decrease it.
"a" represents condition "1" in Fig. 27.
"b" represents condition "2" in Fig. 27.

lamp is as large as any of these elements. The letter strokes are then blurred together and the sign becomes an illegible mass of light.

Fig. 26 indicates the magnitude of the change in spot size. It should be noted, however, that the effect of irradiation becomes greater as the candlepower is increased, because of sympathetic stimulation of adjacent elements of the retina, and smaller as the background (such as that of the sky or building) becomes brighter. For example, by adding a border of lamps to a sign, the background brightness is increased and the apparent spot size is greatly reduced, thus making the sign more legible.

Atmospheric transparency also affects irradiation. In many large cities the atmosphere at times becomes very dense and absorbing. The fog, haze, or smoke has the effect, first of reducing the amount of light which reaches the eye, thus reducing legibility, and second, of refracting the light from the sign and other sources in the district so as to make a bright curtain of light which increases the surrounding brightness, reduces irradiation, and increases the distance at which the sign is legible. The appearances of a sign under five conditions of the atmosphere are shown in Fig. 27.

Within the practical limits of sign design and because larger lamps are ordinarily used in brighter districts, and smaller lamps in darker districts, average conditions and values of these effects may be assumed, thereby making possible a simple but accurate method of predetermining sign appearance.

The exact calculation of the spot size and the confetti method of predetermining sign appearance will be discussed in the next article.

COLOR MEDIA FOR ELECTRICAL ADVERTISING

Natural Colored Glass Lamps

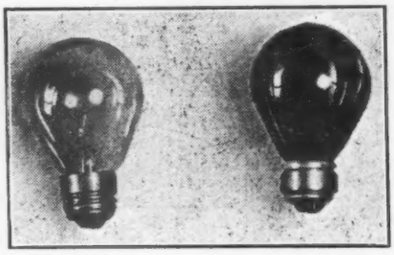


Fig. 22.

Advantages—Good color efficiency, permanent color, brightness and sparkle in higher signs, and smooth surface minimizes dirt collection.
Disadvantages—Higher cost, not ordinarily carried in stock, unattractive when not lighted.

Color Hoods

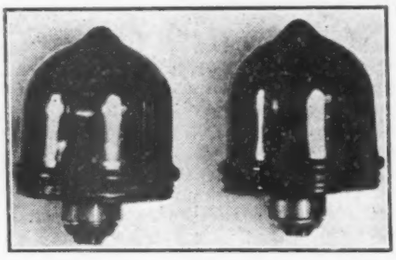


Fig. 23.

Advantages—Good color efficiency, permanent color, brightness and sparkle in higher signs, clear lamps only need be carried in stock.
Disadvantages—Unattractive by day, excessive dirt collection.

Dipped Lamps

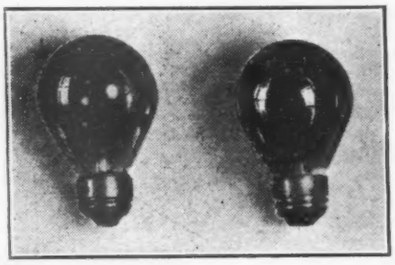


Fig. 24.

Advantages—Fair color efficiency, color readily changed, large range of colors.
Disadvantages—Rapid fading, some brightness and sparkle lost in higher signs.

Spray-Coated Lamps

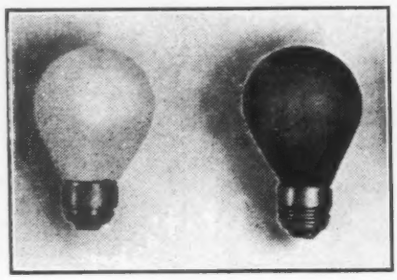


Fig. 25.

Advantages—Attractive color when unlighted smooth appearance at the nearer viewing distances.
Disadvantages—Lower color efficiency, some colors gradually affected by certain atmospheres, brightness and sparkle sacrificed in higher signs.

Questions and Answers on the Code and Safety Orders

Arrangements have been made with Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, to answer through the columns of the Journal of Electricity such questions on the National Electrical Code as are of general interest.

Similar arrangements have been made with George E. Kimball, electrical engineer of the Industrial Accident Commission of the State of California, to answer questions on the Electrical Safety Orders issued by the Commission.

While it is the object of this department to assist in a better understanding of the Code and the Safety Orders, replies given are not to be considered as official interpretations applying in all instances, as some of the rules permit of varying interpretations under different conditions. The questioner should be guided by the inspection department having jurisdiction.

All who are interested are invited to send in their inquiries regarding the National Electrical Code to Claude W. Mitchell, Board of Fire Underwriters of the Pacific, Merchants Exchange Building, San Francisco, Calif., or to the Editor, Journal of Electricity, 883 Mission Street, San Francisco. Questions on the Safety Orders should be sent to George E. Kimball, Industrial Accident Commission, State Building, Civic Center, San Francisco, or to the Editor.

Q. 1. Are motor frames considered as satisfactorily grounded when connected to grounded rigid conduit through flexible metal conduit?

A. In many cases, yes, but in many other cases, no. If connected to circuits of over 300 volts, or if the motor rates more than 50 amp., it will be necessary to bond around the flexible metallic conduit. Order 711-8(b). For the size of the grounding conductor, see Order 704-5(d).

Q. 2. Is identified wiring required or only recommended?

A. The grounded conductor of all lighting circuits must be identified so that it may be located readily and connected properly at fixtures and lamp sockets. See Orders 702-1(y) and 703-11(d). This applies to new installations and additions to old installations.

Q. 3. If a branch circuit for a small 110-volt single-phase motor is tapped off a circuit having the grounded wire identified, should the motor branch circuit also be run with identified wiring?

A. Yes. This is one of the few cases where a motor is wired with identified wiring. However, it is not so important and in some cases might lead to confusion. If a portable cord is used between the outlet and the motor, to ground the frame of the motor as required by Order 711-8(a), this grounding conductor must not be conected to the grounded neutral. See Order 703-11(f).

Q. 4. Is "single-pole-fusing" required by the Electrical Safety Orders?

A. No. Single-pole-fusing must not be used except by permission of the inspection department having jurisdiction, and such permission is not granted until it is proved that the distribution system serving the installation is permanently, effectively and adequately grounded. Special cutout bases, panel boards, etc., are required. See Order 702-1(a).

New Adaptations of Reflected Lighting Equipment*

Reflector Equipment Has Been an Aid in the Progress Made in the Science of Artificial Illumination

By JAMES MUNDSTOCK, Manager, I. P. Frink, Inc., San Francisco

It is the aim of this brief paper to show how reflector equipment has helped in the progress of artificial illumination in more closely approximating sky-reflected daylight.

When we look back over the development of artificial lighting we find that up to the very end of the last century all lighting indoors was done by visible light sources. From the lighted torch in the dark cave, to the flickering wax candles in the palaces of kings throughout the middle ages, up to the time of the gas-clustered chandelier of the first half of the nineteenth century, the illumination of an indoor area was produced from visible fixtures. This should not surprise us when we remember that, prior to the event of electric light, artificial lighting was derived from open burning flames of fuel—such as wood, tar, wax, oil and gas.

With the ability to conceal our artificial light sources from direct vision, we may divide our lighting conditions as nature has divided hers. Outdoors we have direct sunlight, or reffected skylight of different intensities, or a combination of both. Indoors we may have direct illumination from brilliant chandeliers or reflected indirect lighting of various intensities from cornices, through glass diffusers, or we may have a combination of both.

In daylight the clear sky acts as a reflector of direct sunlight and the atmosphere surrounding the earth as its diffuser. In artificial lighting we likewise must have a means of controlling our light source, and in this manner our various types of reflectors have been devised.

Today we are convinced that reflector equipment will play an increasingly important part in the progress of artificial light towards a closer approximation of daylight. The history of reflector development is a very recent one, yet the demands for its improvement have been many. Without going into the different branches of reflector manufacture, I shall point out only a few of the more important demands.

First: The design of the reflector must be accurate in order to control the light output for a given condition.

Second: Reflectors must be made from materials which give a certain flexibility as to the size of the reflector. For some conditions it has to be extremely small, and for others as large as possible.

Third: On all types of reflectors which are wired at the factory easy means of installing and connecting the reflectors have to be provided.

Fourth: Greater demands on the means of mounting the reflectors under all sorts of conditions are constantly being made.

Fifth: In cases where reflectors cannot be concealed from direct vision demands have been made for means of diffusing the light sources thus reflected. In this way the different kinds of diffusing glasses of which the pebbled and ribbed type are most prominent, have been developed.

Sixth: By far the most important feature of reflector equipment is the reflecting surface, and naturally the greatest demands have been made on its improvement.

While reflector equipment, from the beginning of its appearance, was designed and manufactured by persons or firms specializing in this work, it is to be regretted that among the general public as well as among many architects, reflectors are classified as lighting fixtures. It is to be hoped that all engaged in the development of better artificial lighting will make it a point whenevr the occasion arises, to make the distinction between the two branches of the lighting industry, namely, the making of lighting fixtures and the making of reflectors.

While the designer of lighting fixtures is preeminently an artist, the designer of reflectors must be an illuminating engineer. Reflectors are an integral part of a building; chandeliers are a part of its decoration.

We may think of a chandelier as an object of art, the principal expression of which is illumination. We may think of a reflector only as a medium for the accomplishment of good lighting. It is true of course that reflectors may be designed to produce a certain artistic lighting effect, but in this case light itself is the object of art, and not the fixture.

In actual experience I have found that the most striking lighting results have been produced by a combination of visible and concealed lighting. This is especially true in large interiors.

When we consider the thousands upon thousands of years in which man has lived and developed in the open, we find that our years of civilization and indoor life are like nothing in comparison. It cannot surprise us, therefore, that our physiological nature is still fundamentally the same. It demands that our light sources should come from above; it demands that the light should be variable. It needs different brightness and shades of light, but it also demands that the light source should be visible at times, and then again concealed. This is the principal reason why the lighting in a large interior such as a public hall is most pleasing when part of its source is visible and part unseen.

All of us who are devoting our life's work to the perfecting of artificial lighting may perform a great service to mankind. It consists in bringing our influence to bear upon architects and builders to regard the lighting as an integral part of the building and not, as is often the case, to regard it as an appendix to the finished job.

We shall see much progress in artificial lighting during the remainder of this century, and I believe the best work will be accomplished wherever the architect, the engineer and the manufacturer will work hand in hand toward the same aim, which is to make the world a brighter and happier place for mankind.

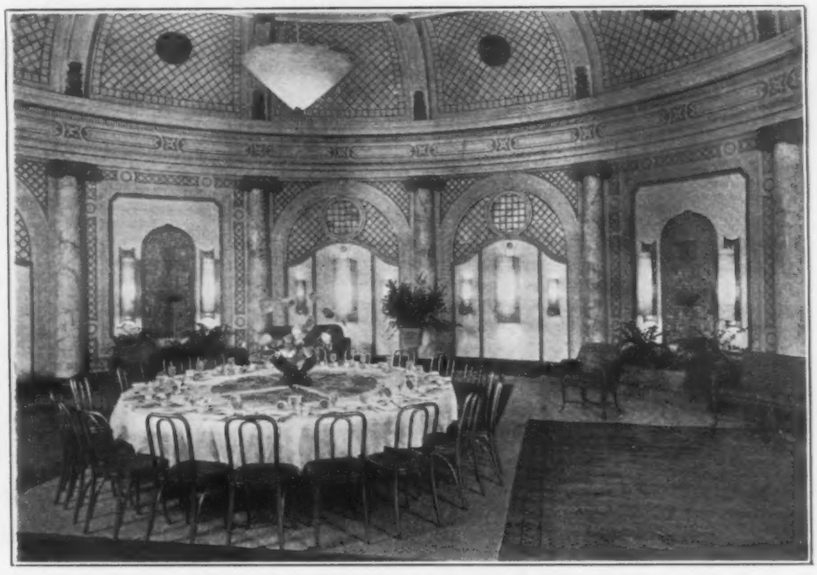
*Extract from a paper presented before the San Francisco Bay Cities Chapter of the Illuminating Engineering Society.

Electragist Opens Remodeled Store in Santa Ana

The Robertson Electric Company of Santa Ana, Calif., recently held the formal opening of its newly remodeled store. The upstairs portion of the store was remodeled entirely and a large basement was added.

The basement is arranged for attractively showing heavy-duty equipment such as electric ranges, air heaters, electric ironers and washing machines. The radio demonstration room is also located there.

The main floor is arranged for displaying smaller appliances and material and contains the general and private offices. In addition there are several fixture display rooms.



The Laurel Court in the Fairmont Hotel, San Francisco, after it was remodeled and a new decorative lighting system was installed. Irwin color filters replaced the old fixtures.

BETTER MERCHANDISING

To Feature One Appliance Each Month

Monthly Appliance Specials Adopted by N.E.L.A., P.C.E.A. and Southern Electragists Co-operating with Edison Company

Doing one thing at a time, and that thing well, long has been regarded as an axiom. That it should apply to the selling of electrical appliances now is being made evident in several successful programs embodying that principle. No longer an experiment, that axiomatic truth will be applied during the forthcoming months with even more energy than before. A number of instances of this are to be noted in various sections of the West, and indeed the appliance committee of the Commercial Section, Pacific Coast Electrical Association, has centered its job for the year about this idea.

"Each month an appliance, and every appliance its month" well might be used to sum up the idea. The virtues of such a concentrated program are at once evident. Especially so is this true if all electrical outlets also concentrate upon the same appliance during the same period.

The combined effect of every electrical outlet for appliances featuring say, toasters for one month cannot help but result in increased toaster distribution for all who handle them. Every electrical contractor-dealer, every central station which merchandises or which advertises to assist its merchandisers, every department store or hardware store selling electric appliances—all these by advertising, billboarding, talking, displaying, featuring, and exerting special sales effort on one appliance, will act as a veritable barrage for that appliance's sale.

The idea is not an untried one. Several Eastern communities have used the method successfully. Some of the merchandising central stations of the Mountains states, one in particular of California, and one in Texas, have been known to use the plan and benefit from it.

What Some Companies Have Done

The Valley Electrical Supply Company, of Fresno, Calif., according to the report made in the last issue of the Journal of Electricity on merchandising results and programs for 1925-1926, (p. 102), used this idea to its satisfaction and plans to intensify it this year.

The El Paso Electric Railway Company, of El Paso, Texas, started the year 1925 with the idea, "1925—Make it Electrical," and followed it with a month-to-month program of appliance sales. To impress the public with its purpose to make the year electrical, it used effective window displays, put banners on its street cars and framed posters on its company automobiles carrying its slogan. Each month was given its particular slogan and sales drive. Each month was assigned one appliance to be featured, the program having been as follows:

January—One-Two-Three Sale.
February—Irons.
March—Kitchen Lighting.
April—Ranges.
May—Vacuum Cleaners.
June—Fans.
July—Fireless Cookers.
August—Percolators.
September—Washing Machines.
October—Lamps.
November—Air Heaters.
December—Christmas Sales on All Lines.

Special "Cash and Carry" Offer
$3.75
is the complete purchase price of this Durable Aluminum Percolator
6 cup size, with ebony-like handle, complete with coffee basket and cord, ready to use.
By placing an unusually large order we can offer this percolator with a two years' guarantee at this remarkable price. Think of getting an electric percolator for the price of a plain coffee pot!
HOW YOU CAN GET ONE
1. CALL AT OUR OFFICE 2. SELECT A PERCOLATOR 3. PAY CASH $3.75 4. CARRY IT HOME
SOUTHERN CALIFORNIA EDISON COMPANY

Envelope stuffer used by the Southern California Edison Company in its percolator special which led to the adoption of a monthly appliance feature sale in which the Electragists joined.

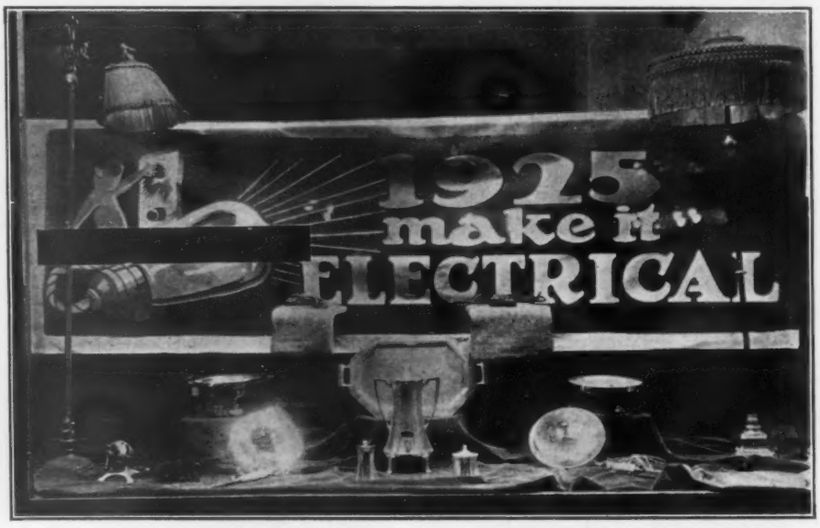
Although no final report on these campaigns has been made, it is known that each was found effective in the selling, not only of the particular appliance featured each particular month, but of others as well. Customers buying the featured appliance often were sold other electrical merchandise as well, ranging all the way from spare fuse plugs or lamps to washing machines or ranges.

The value of such a campaign plan seems to lie in the prospects it produces for other business as much as in the particular appliance especially featured at the time.

P.C.E.A. Appliance Committee Plans Co-operative Campaign

In seeking to prepare some program for the year which would be of widespread value to the electrical merchandiser, the appliance committee, now known as the merchandising committee of the Commercial Section, Pacific Coast Electrical Association, set itself to a worthy enterprise in the planning for an all-year program of monthly or weekly features in merchandising appliances. The subject was discussed at each of the committee's sessions, and the tentative program as finally outlined stands as follows:

January—Following closely upon Christmas, Toasters.
February—Waffle Irons, on account of the extensive drive made by The Washington Water Power Company during that month, that was very successful.
March—On account of spring cleaning, Vacuum Cleaners.
April—In anticipation of summer heat, Ranges and Percolators.



At the beginning of its monthly program of specials the El Paso Electric Railway Company set out to establish 1925 as an Electrical Year. This window display was used in conjunction with street-car banners and posters on company automobile equipment.

May—On account of climatic conditions, Refrigerators and Table Stoves.
June—Because of June Bride Week, All Appliances, all the month.
July—Fans and Kitchen Ventilators.
August—Irons and Ironers.
September—Washing Machines, Hair Wavers and Curlers and Miscellaneous Small Appliances.
October—Ranges and Stand and Table Lamps.
November—Heating Week, Air and Water Heaters.
December—All Appliances All the Month.

While this program is only tentative, it shows consideration of such environmental conditions as weather, special holidays and events, and like activities.

It was proposed by the merchandising committee in its meetings that the program be perfected and then turned over to the California Electrical Bureau for execution, since the activities of the Pacific Coast Electrical Association have been considered to be of an investigational and advisory rather than of an executive nature.

Edison-Electragist Program Under Way

In conjunction with the California Electragists, Southern Division, the Southern California Edison Company has inaugurated a monthly special program for the first six months of 1926, and that campaign plan is already in operation. H. C. Rice, appliance sales agent of the Edison company, says of it:

"We have discussed the possibility of running a monthly special on some one appliance here in the south for some years, the matter having come before the Commercial Section of the P.C.E.A. several times. In the spring of last year the Southern California Edison Company undertook to run specials on irons and then on percolators, both of which were very successful. The local jobbers and dealers then became interested and through the medium of the merchandising committee of the Electragists, with the co-operation of the jobbers, we designated the month of October as Toaster month.

"Toasters were sold at a special price, which was approximately list, less 20 per cent. This special sale was quite successful, considering the short time in which we had to prepare for it, and, as a result, a meeting was called and a schedule of monthly specials beginning Jan. 1 was arranged as follows:

January—Air Heaters.
February—Toasters.
March—Ranges and Water Heaters.
April—Waffle Irons.
May—Percolators.
June—Irons.

"Since the above schedule was arranged we have received information from the N.E.L.A. to the effect that they are contemplating a similar series of specials to be run each month beginning with March, as that is the earliest time the advertising departments of the various manufacturers could prepare the necessary publicity. However, their schedule does not coincide with ours, as they have designated toasters for March and percolators for April, specials for the balance of the year to be decided on later.

"We are working very closely with the jobbers and the Merchandising Section of the Electragists to co-ordinate all plans on specials so that the entire industry in southern California will concentrate on the same device—not necessarily of the same make—at the same time."

March Is "Toaster Month" Throughout Entire U.S.

N.E.L.A. Sponsors Appliance Campaign; Several Sections Plan to Tie In with National Advertising

For March it will be toasters. This has been decided by the powers that be, if such exist, and with a national advertising effort to tie to, plans are being made in many sections of the West to make March a toaster month.

Sell Toasters on These Advantages

1. Talk CONVENIENCE. Never mind the construction of the toaster. It is the customer's convenience and comfort that you are selling, not YOUR toaster.

2. SPEED is an important factor in a busy life. The electric toaster will toast more quickly, and let the customer go on to her morning's work earlier and better satisfied.

3. Less ATTENTION required. No need to wait over a stove for toast, fearing it may burn, and having to give it constant attention. Toast is made right at the table as you need it with an electric toaster.

4. DELICIOUSNESS of electrical toasting is due to the toast being fresher, hotter, and served as wanted. The electrical toaster crisps the surface and keeps the toast mellow inside.

5. CLEANLINESS is a big item. An attractive nickel finished toaster is easily kept clean. Merely wiping it with a dish towel keeps it clean.

6. APPEARANCE sells many appliances. An electric toaster is something which a housewife can point to with pride. It is an attractive article of modern home furnishing.

7. ECONOMY is less important than any of the above reasons, but it figures in many cases. The saving in time and absence of burnt or spoiled toast is worth many times a toaster's cost. Its operating cost figured out per breakfast is also so low that it can be used effectively in sales.

8. CONSTRUCTION is an important feature to some folks, but it should be discussed only if asked for. Convenience, appearance and tastiness are more effective sales features. If construction is asked about, describe the toaster's guarantee, the workmanship, the reliability of the manufacturer and then its particular points of advantage.

BUT SELL CONVENIENCE FIRST.

The monthly feature idea has come into its own. Tried in various sections of the country and found a success, it has been adopted as a national policy by the N.E.L.A. merchandising national committee. Co-operating with the central-station companies, dealers and non-electric outlets, in placing electric appliances on the market, the manufacturers and jobbing organizations are planning to feature one appliance a month in national advertistising. And for March that appliance will be the toaster.

Each manufacturer of course will feature his especial brand of toaster. And in the same way each dealer will feature the kinds of toasters he carries in stock, if he wants to tie in with the national advertising and program. The result should be that no store handling electric appliances, be it a central-station store, an electric dealer, a department or hardware store should be without its toaster display during March.

For results with toaster sales it would be a wise plan for any merchandiser to consider all effective ideas for the sale of such appliances and use those which suit his local conditions the best. The experience of others in this respect is valuable. For the purpose of aiding merchandisers in sales plans and ideas, there will be found in these pages several sales plans and ideas for the effective display, advertising, and more important still, SELLING OF TOASTERS during "Toaster Month"—March, 1926.

Acceptance Corporation Formed by Edison Officials

For the purpose of financing the installment sale of electrical and gas appliances by dealers and the merchandising departments of the public-utility companies, interests identified with the Southern California Edison Company have organized the Southwestern Acceptance Corporation, a Delaware corporation, with an authorized capital of $2,000,000, seven per cent cumulative preferred and 40,000 shares of common stock. Both stocks have a par value of five dollars.

The new company will discount the installment contracts on appliances sold to consumers throughout southern California by appliance dealers and the Southern California Edison Company. The particular function of the company is to promote the sale of electrical appliances, including refrigerators, ranges, water heaters, ironers, vacuum sweepers and air heaters. Many dealers, it is explained, are unable to stimulate sales of electrical appliances by the installment method, because of lack of capital. The acceptance corporation is designed to supply the deficiency.

With the exception of Norman L. MacLeod, the president of the acceptance corporation, all the directors are affiliated with the Edison company. They are: John B. Miller, R. H. Ballard, S. M. Kennedy, Ben M. Maddox and Mr. MacLeod. The other officers are S. M. Kennedy, vice-president; Byron Fluno, secretary, and E. G. Miller, treasurer.

Toaster and Tray Make a Salable Combination

Appliance Campaign in Southern Colorado Built on Combination Offer at Special Price

Where an appliance by itself may attract only so many customers, it sometimes develops that the addition of a small article to it, making a combination offer, will give the resulting special much more selling power. Such at least was the experience of those in charge of an appliance campaign put on in the territory of the Southern Colorado Power Company last summer. A. R. Wooley, district manager of the Edison Electric Appliance Company in that territory, had charge of many features of the campaign, which was sponsored by the power company.

The sale was a three-appliance affair, and it was decided to encourage sales by means of a premium with each appliance. Toasters, irons, and percolators, were offered in this particular sale. With the toaster, of the turnover type, a 13-in. round tray, made of good quality heavy copper and well nickel-plated was secured at a good price. With the percolator a creamer and sugar bowl of good quality were secured. With the iron an ironing board was offered, and an allowance of a dollar was made on an old iron. Where no iron was turned in a credit of 50 cents was allowed to remove possible charges of partiality.

The toaster combination was as follows:

	List	Cost	Sell
Toaster	$8.00	$4.80	
Tray	4.00	.90	
Total	12.00	5.70	$9.00

The percolator offer was arranged on a similar plan; a $20 list-price combination costing $10.20, was arranged to be sold at $13.50. With the iron a $10 list-price combination was offered at $8.50, it having cost $5.40.

Terms were arranged so that customers desiring them could buy any one offer at $1 down and $1 with each light bill until paid out. With the toaster a special effort was made to sell also the percolator offer. The percolator was shown with the tray used in the toaster offer, and the idea that a toaster was necessary to complete the set was used effectively to sell both appliances. To make this easier, no increase in down payment was asked, the payments being extended until the two offers were paid for.

Orders were solicited only from prospect cards made up on approved credit customers, so that the salesman calling was free to close each sale without worrying about credits. He also had the prospect's name, which furnished him with a good introduction. Orders were written up on a special blank provided for the purpose, made up in convenient pads.

Salesmen were paid commissions of $1 on the toaster and iron offers and $1.50 on the percolator offer. Half of the commission was paid on the following pay-day, the balance on the next following pay-day. This was done so that if repossessions were necessary, the commission could be deducted at the second period in case it had been half paid at the first pay-day. No repossessions were experienced, however.

Sample Cases Important in Making Appliance Sales

Designed for the purpose, the special sample cases used by the salesmen were responsible for closing many sales. They were made of beaver board, stained light brown, and decorated with the Hotpoint red man on each side. One side opened to allow the salesman an opportunity to display his samples attractively.

The publicity given the sale consisted of a broadside and a limited number of newspaper ads. Mr. Wooley felt, however, that had more newspaper space been used, better results could have been obtained. Window displays played an important part in the sale. One window used large cut-out, flat replicas of the appliances on sale, painted with aluminum paint, and this proved so good that three sets were made up and used in each of the towns served by the company. Each of the individual district offices used window displays prominently in the advertising of the program.

Altogether about 500 appliances were sold in the campaign. The iron proved to be the best seller, with the percolator set next, but of the toasters 75 were sold by the power company and 112 by the Edison Electric Appliance Company.

Attractive window display used by Southern Colorado company in its three-appliance sale.

Toaster Campaign Sells 1,000 Toasters in One Month

Last year 1,000 electric toasters were sold during a month campaign by the Valley Electrical Supply Company, of Fresno, or 300 more than it sold in the entire other eleven months of the year. Moreover those principles upon which the sale of toasters last year was conducted with such success are going to be developed by the Valley Electrical Supply Company this year for its toaster campaign in March, according to J. U. Berry, advertising manager of that company.

Beginning with an exceedingly attractive broadside, distributed from door to door, and followed up by liberal newspaper space and effective window displays, last year's sale proved that to feature one appliance at a time and to "hit" that one hard, would bring customers to the store in numbers, a great many of whom would be interested in buying other electrical goods.

Buying in quantity, a special feature price on account of quantity could be offered. Special terms, attractive to the buyer, were arranged for. The toaster was offered at $3.95, with a down payment of $1.95 and $1 a month for two months to pay the balance.

The broadsides were printed on a book paper rather than the customary news stock common to dodgers. This, according to Mr. Berry, costs so little more that it is to be desired, for it places the campaign in a better class than one advertised on news stock.

A large, almost life-size, drawing of the toaster, with the price and terms prominently displayed, was made the center of interest on the broadside. Newspaper ads were almost as large, and consequently attracted as much attention as did the broadside.

The company had just closed an especially successful campaign on fireless cookers the month previous. To those who had bought a cooker a letter was addressed advising of the bargain on the toaster. This letter, too, was felt to have aided in the results achieved.

A new policy with regard to its special appliance sales is to be worked out by the Valley Electrical Supply Company this year. Being the merchandising agency of the power com-

pany, the San Joaquin Light & Power Corporation, the benefits of the special appliance sale are to be made available to the customers of that corporation in small towns not immediately available to Fresno, the city in which the store itself is located.

Will Act as Jobber to Small Dealers in Outlying Districts

That the customer in the district may enjoy the benefit of the special price and terms offered the city dweller, the Valley Electrical Supply Company plans to act as jobber to the small town dealer for the sale of the featured appliance. The advertising done in the small country papers makes much of the fact that the featured toaster, for instance, may be bought at the feature price and terms from the local electric dealer. The dealer is sold the appliances upon such terms as will make it possible for him to handle such sales and benefit by them. This plan was put into practice in the waffle-iron campaign this month (February) and is expected to be used for other similar feature sales.

Feature Sales Stimulate Morale of Store Personnel

"We plan to take care of these feature sales with our regular staff," said a member of the company. He went on to say that the advertising and planning of a feature sale "pepped up" the sales force and made them feel that there was plenty of excitement at all times. Therefore, the extra effort in behalf of a sale is placed on the advertising. If, by putting on a feature event, a greater volume of business can be done without adding to the overhead or personnel, the effort is felt to be very much worth while.

Giant Toaster Makes Attractive Window Display

Striking an original note in window display, a feature of sales work for which the Valley Electrical Supply Company rapidly is gaining renown, the toaster campaign of last year enabled Mr. Berry to make an unusually effective window display with a giant toaster and equally giant slices of raisin bread toast. A model of the toaster on sale was fashioned out of wallboard and painted with aluminum paint. The front of the toaster was left down, and upon it was seen a large slice of raisin bread (which the San Joaquin Valley raisin growers are especially anxious to see on every table), nicely toasted, resting upon it. This toast was made ingeniously from a special loaf of bread, baked for the purpose by a local bakery. It was made in a large, flat loaf, about 3 ft. square. The crusts of the bread were removed by a single slice, and the resulting "giant" slice of raisin bread, about 2 in. thick, was placed in the oven and toasted.

To simulate the elements of the toaster, wound on sheets of mica, two sheets of glass were used, upon which the "elements" were painted. The entire toaster stood about 3 ft. in height and made so realistic an impression that it caused considerable comment. The same toaster is to be used in the March toaster sale this year.

Think of This!
A Giant Turnover
ELECTRIC TOASTER
for only
3.95
Approved by the National Bakers' Association
$1.95 DOWN
It is just as Great a Value as the Cooker
Easy Terms
$1.95 Down
Balance in Two Equal Monthly Payments
You have always wanted a good Electric Toaster
Here it is at only half what you expected to pay
—We say that it is the best Electric Toaster we have ever seen, even at a far higher price —and you'll agree with us when you have compared it with others.
—Now imagine buying it for only $3.95—at $1.95 down and the balance in two equal monthly payments. You surely cannot afford to pass this opportunity by.
Delicious, Crispy-Brown Electric Toast
—The basis for making toast is heat, properly applied. This Electric Toaster concentrates and applies the heat evenly over the entire surface of the slice of bread, toasting it to an appetizing golden brown.
—Perfect toast should be done to a crispy brown surface with the moisture and freshness of the bread retained in the center of the slice. This can only be done with a red-hot flameless heat. That's the Electrical Way.
Takes the Largest Size Slice of Bread
—This toaster will hold a slice of toast from the largest size standard load of bread up to 4¼ by 4¼ inches. It is a flip-flop or turn-over type.
—This toaster is finely nickel finished, with heat insulated doors, crumb drop arrangement, equipped with hand-laced Chromel element, flexible cord, two-piece attachment plug and terminal connector. Built for lasting service.
It Toasts Correctly
VALLEY ELECTRICAL SUPPLY CO.
PHONE 3397 FRESNO SAN JOAQUIN POWER BLDG.
It Toasts Quickly
Sale Starts Monday September 14th
All Out of Town Mail Orders Shipped Promptly

Advertisement used by Valley Electrical Supply Company in its toaster campaign.

NEWS OF THE INDUSTRY

Edison Company Proposes to Reclassify Authorized Capital Stock

Presenting to the 80,000 stockholders of the Southern California Edison Company a proposal for a reclassification of the several issues of its capital stock and the reduction in par value from $100 to $25 per share, John B. Miller, president of the company, in a letter to stockholders announced the approval of the company's board of directors to these changes, subject to ratification by stockholders.

In the proposal for a reclassification of the company's authorized capital stock of $250,000,000 the amount of common stock remains the same at $125,000,000, or one-half of the whole. The principal change is in the reduction of $30,000,000 in the authorized seven per cent preferred stock series "A", and this is proposed to be accomplished by increasing the authorized six per cent preferred stock series "B" by $10,000,000 and by the authorization of a new issue of five and one-half per cent preferred stock of $20,000,000.

All stockholders will have the same ratable position as formerly, the company officials state, and the reduction in the amount of authorized seven per cent preferred stock, with the authorization of an increase in similar amount of authorized preferred stocks carrying a lower dividend rate, will have the effect of strengthening all classes of stock as well as securing for the company cheaper money for its future construction requirements.

The president's letter shows that as of Nov. 30, 1925, total outstanding capital stock of all classes was, $109,994,700, which, it is understood, has been increased by several million dollars since that date by additional sales of stock to the public.

The proposed changes will take the form of an amendment to the articles of incorporation of the company which the stockholders will be asked to ratify at the annual meeting to be held in the company's offices on March 19 next.

In presenting the reasons why these changes are considered expedient, Mr. Miller says in part:

"The purpose of changing the classification of stock is to procure cheaper money in the future with which to finance our company's continually expanding development program. The proposed change is financially beneficial to all holders of stock now outstanding. It is believed that the change in par value of all stock from $100 to $25 will result in cheaper money, in that new shares of the lower par value can be sold for higher aggregate prices than shares of the former par value. Our board of directors also believes that the reduction in par value of shares will be of material assistance in the future extension of the customer-ownership plan of stock distribution inaugurated by our company in 1917. Since that time the number of stockholders has been increased from less than 2,000 to 80,000.

"Under the proposed amendment every present stockholder will be entitled to exchange the certificate or certificates he now holds for new certificates calling for four times as many shares of the same classification of stock at the lower par value; for example, a stockholder having a certificate for one share of Preferred stock, Series A, seven per cent of the par value of $100 will be entitled to exchange it for a new certificate calling for four shares of preferred stock Series A, seven per cent of the par value of $25, and so on, as to each kind of stock, both preferred and common."

San Diego Utility Plans Another Steam Unit and Substation

Expenditure of $1,500,000 for increased generating capacity for Station B of the San Diego Consolidated Gas & Electric Company has been announced by the Byllesby Engineering and Management Corporation. This includes the new double-intake tunnel of approximately 1,300 ft. from San Diego Bay to Station B at Kettner Boulevard and E Street, a new 20,000-hp. steam turbine, additional boiler capacity and 6,000 kw. in transformer capacity, together with other auxiliaries. Installation of the new turbine will bring the capacity of this station to 47,000 hp. Work on the tunnel is well under way, and the transformers are scheduled for early delivery. This is the first part of the 1926 program, the remainder being as yet in a state of preparation.

One of the major projects will be known as Substation F, located between Boundary and Iowa Streets below El Cajon Boulevard. The capacity of this station, which will take care of the distribution for East San Diego, Normal Heights and Kensington Park territory, will be 3,750 kw. at 4,000 volts. It will cost in excess of $100,000 for initial building and equipment, and present plans contemplate a material increase in its capacity and equipment within the next two years. Additional capacity at Station C is also under consideration.

The company already has surveys and plans for numerous extensions in the rural sections of San Diego County, particularly in its northern territory. The budget will include extensive additions to the underground system in the commercial section of San Diego. Figures on these other improvements are not yet ready but will approximate the figures already given out for the major improvements at Station B, bringing the probable total of the 1926 budget to $3,000,000.

Acquisition of Business Causes Formation of New District

The acquisition of the business of the Northwestern Power & Manufacturing Company, Port Angeles, Wash., of the Sequim Light & Power Company, Sequim, Wash., and of the holdings of the North Pacific Public Service Company at Bremerton, all on the Olympic peninsula, by the Puget Sound Power & Light Company, Seattle, (Journal of Electricity, Nov. 15, 1925, p. 393, Dec. 15, 1925, p. 466, and Jan. 1, p. 27) has made necessary the establishment of a new operating district, called the western district. Temporary headquarters were established at Sequim Dec. 1, 1925, to handle a portion of the business on the peninsula, and on Jan. 2 permanent headquarters were established at Bremerton with jurisdiction over all business on the peninsula. E. T. Steel, formerly manager of the southern district, has been appointed manager of the newly formed western district.

Other members of the organization are: C. F. Kirchhaine, acting assistant treasurer; F. H. Kerr, sales manager; E. R. Nigh, superintendent of light and power; W. F. Sachtleben, resident manager at Bremerton; J. L. Keeler, resident manager at Sequim; and J. M. Kinkaid, resident manager at Port Townsend.

The Puget Sound Power & Light Company has taken a lease on the entire lower floor of the Elks Building in Chehalis, and the executive offices of the southern district will be moved there from Portland as soon as the quarters can be furnished. Departments at Chehalis will include operating, construction, sales and accounting.

A. M. Chitty, formerly superintendent of light and power, northeastern district, with headquarters at Everett, has been named manager of the southern district. Frank Walsh, formerly superintendent of light and power, eastern district, succeeds Mr. Chitty as superintendent of light and power for the northeastern district.

Other personnel changes are announced as follows: G. H. George, formerly assistant superintendent, northern district, becomes superintendent of light and power, eastern district; W. A. White, until recently engineer, southern district, is now general superintendent of that district; and W. A. Schoel, who has been resident manager at Chehalis, has been made sales manager, southern district.

Los Angeles Plans Transmission Line to Boulder; Arizona Threatens Years of Litigation

"Excepting the recommendation that the power be sold to the highest bidder," Los Angeles city council feels that the recent recommendation of Secretary of the Interior Work proposing the erection of a 550-ft. dam and a power generating plant is an endorsement of the project sought for some time and that while some minor points might be changed, "the committee does not feel them to be important enough to cause a controversy." Plans are being made, therefore, to have the Department of Water and Power make a survey of the cost of a transmission line, according to a recent newspaper report.

A resolution to have such a survey made was introduced by Councilman Randall, chairman of the Water and Power Committee of the council. He is reputed also to have said that he contemplates the placing on the ballot next November of a bonding proposition for the construction of such a transmission line to Boulder Dam.

Meanwhile negotiations to effect an agreement with Arizona on the development of the Colorado are known to be deadlocked again.

Senator Johnson and Representative Swing of California have accepted the plan of Secretary Work for the construction of the Boulder Dam project and for the building of the All-American canal. Arizona, however, has raised a strenuous protest against the "coercing of a sovereign state by the federal government." Senator Ashurst, Arizona's senior senator, has raised the point before the irrigation committee that the proposal to raise money by the sale of power makes the bill a revenue measure which under the rules must originate in the House. Some of the committee members are inclined to agree with that point of view. Senator McNary, the chairman of the committee, is not particularly friendly to the Work proposal.

On the House side Representative Hayden, of Arizona, has served notice that Congress will involve the Colorado River in litigation that will last for a generation if it passes the proposed legislation. He says that his state will enjoin any works started on the Colorado under any such plan.

There also is objection to the bill from those who are not concerned particularly with what may happen to Arizona. There are many who think the development of the Colorado should be undertaken by private capital. They think the Water Power Act should be let alone. Congress, after ten years of effort, sets up a water-power policy, they point out. The ink hardly is dry on the statute books until various efforts are set on foot looking to a different policy on the more important power streams. If these efforts are successful, it is contended, capital which has begun to flow into water-power developments will be withdrawn from such undertakings. There is nothing to justify the investment of the taxpayers' money in a business undertaking of this kind into which private capital is ready to go, these people maintain.

The point also is made that, since Arizona pays a portion of the taxes which would be used in the construction of the proposed government project, it could not be denied the benefits of the development.

Another recent development of the situation is the feeling that the Pittman bill, which would suspend the authority of the Federal Power Commission to confer rights on the Colorado River or its tributaries, apparently has no chance of being considered by the House committee. Some of the senators who allowed the measure to get through the upper House now regret that they did not insist upon the consideration of the bill by committee. Consideration was not given to the fact that the suspension of the Power Commission's authority would bring to a standstill most electrical development in the entire Colorado basin. No transmission line over public lands could be authorized. No extensions of existing hydroelectric plants could be undertaken.

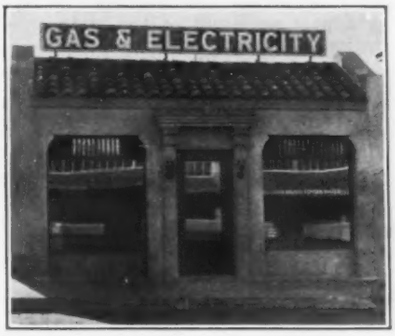
Announce Mokelumne Plant After Federal Commission Grant

The Federal Power Commission formally has approved the transfer to the Pacific Gas and Electric Company of a license for the development of water-power projects on the upper reaches of the Mokelumne River in Amador and Calaveras Counties, Calif. (Journal of Electricity, Nov. 1, 1925, p.351)

The license originally was awarded to J. W. Preston, Jr., representing Emory Winship, and trustee of the estate of Katherine Dillon Winship, deceased, owning a considerable tract of land along the banks of the Mokelumne River. The Pacific Gas and Electric Company has acquired these properties and accompanying water rights by purchase in order to provide additional storage facilities for its Electra power system in Amador County.

The original installation on the Mokelumne River was made primarily for supplying electric power to the mines in the Mother Lode section running through Amador and Calaveras Counties, but later, when thel arger Electra plant was installed, the transmission lines were extended to Stockton and thence to San Francisco so that the greater part of the output of Electra now is supplied to valley consumers, aiding in the prosecution of industrial as well as agricultural enterprises. The license now transferred will furnish the Pacific Gas and Electric Company additional water supply and a location for an additional power plant for the system.

Work is to be undertaken shortly that will involve the construction of a dam on the Mokelumne River at Salt Springs, approximately four miles upstream from the junction of the river with its principal tributary, the Bear. The dam site is at an elevation of 3,800 ft. above sea level. The dam itself will be 200 ft. in height, or rock-fill formation with concrete face, creating a reservoir of 60,000 acre-ft. capacity. The water will be conveyed by concrete-lined canal and tunnel along the northern slope of the stream a distance of 25 miles to Tiger Creek, and from that point will be dropped 1,200 ft. to operate a new power house of 40,000-hp. capacity.



Attractiveness of its buildings has been made a standard by the San Diego Consolidated Gas & Electric Company. The new La Mesa district office, recently opened, upholds the reputation of this company for buildings of an artistic character.

New Transmission Line for Los Angeles Power Bureau

Work on a new transmission line for the Bureau of Power and Light, Los Angeles, between the central receiving station at North Main and Power Streets and the Harbor District at Wilmington where it will connect with the new substation for that district, a distance of about 26 miles, is to begin immediately, according to a statement issued by E. F. Scattergood, chief electrical engineer for the bureau.

Work on clearing up the right-of-way for this line has been begun and should be completed by April 1, at which time actual construction work on the transmission line is to start. The right-of-way varies in width from 100 to 160 ft. The line is to be operated at 110 kv., but is to be so constructed as to make it possible to raise the voltage to 220 kv. should future conditions make this necessary. The line will be built on steel towers with copper conductor. At the 98th and South Park substation there will be a tie-in with the Laguna Bell substation of the Southern California Edison Company, and at the Wilmington substation there will be a tie-in with the Long Beach steam plant of the Edison company.

Joint-Pole Agreement Made with Telephone Companies

Having as its object the increased use of joint poles by the utilities, an agreement has been entered into by the Southern California Edison Company and thirty southern California telephone companies whereby the Edison company will rent to the telephone company the right to use a pole rather than sell a half-interest in the pole as has been done heretofore.

F. V. Rhodes, telephone engineer of the California Railroad Commission, who was a member of a committee appointed by the commission to arrange for this agreement, is of the opinion that not only will this new system make for a more general application of the joint use of poles but will result in large savings in the making of extensions in the outlying communities.

Expansion Program Announced by Electrical Manufacturer

The Electrical Products Corporation with headquarters in Los Angeles, has announced an extensive program of expansion. The capital of the company has been increased to $1,000,000. The company has purchased the factory and business of the National Electric Sign Company of Oakland, Calif., and is doubling the size of the plant as a nucleus for Northern California production. A service and sales building is maintained in San Francisco and also in Oakland. Arrangements are being made to convert the present agencies at Seattle, Wash., and Denver, Colo., into integral parts of the company. Offices will also be maintained at Portland, Ore., and Salt Lake City, Utah. The existing business in Mexico City will be enlarged. The Los Angeles factory is being doubled in capacity.

The company has acquired the rights to manufacture Claude Neon illumintion specialties which comprise outline lighting for buildings as well as electric signs, the light being obtained by high voltage discharge through exhausted tubes containing a minute amount of rare Neon gas. In addition to this the company will specialize in all forms of theatrical illumination and equipment.

The directors of the company include: John B. Miller, president Southern California Edison Company; George I. Cochran, president Pacific Mutual Life Insurance Company; Wm. L. Stewart, president Union Oil Company; W. I. Hollingsworth, realtor. The management of the company is the same as it has been: Paul D. Howse, president; John W. Harris, vice-president and treasurer; other vice-presidents in charge of various activities are: W. E. Joost, J. T. Northcutt, Tracy W. Simpson and J. E. Tucker.

William E. Joost was formerly president of the National Electric Sign Company which has been purchased. Tracy W. Simpson was in charge of the Pacific Coast business of the Federal Electric Company for the past ten years. The other officers have been with the Electrical Products Corporation for a number of years.

Work has been started on the new manufacturing unit for the company at Thirtieth Street and San Pablo Avenue, Oakland, Calif., by the Austin Company of California. According to the plans the new building will provide an additional 17,500 sq. ft. of floor space for the Oakland plant. This included the wrecking of structures now standing on the site and the erection of a building 75 x 125 ft. A paved yard 50 x 125 ft. is planned to expedite the handling of shipments, and a canopy shed 14 x 75 ft. will be constructed. The main structure will be of brick and steel construction with sidewalls of fenestra steel sash to give ample light and ventilation.

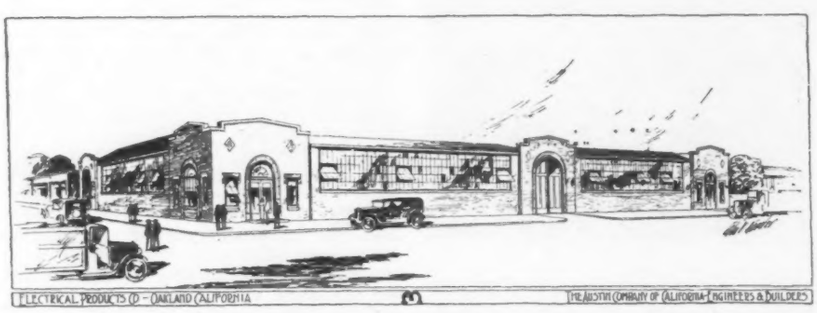
This unit of 17,500 sq. ft. is the second erected by this company during the past year. The two units, a total of 27,500 sq. ft. represent one of the largest sign plants in the West.

Western Man Receives Honorable Mention in McGraw Award

J. Robert Crouse of Cleveland, founder of The Society for Electrical Development, Inc., and more recently organizer of the Electric Refrigerator Manufacturers' Council, has been awarded the James H. McGraw medal for co-operation. This award completes the first of a series of four annual awards established by James H. McGraw to encourage individual initiative and creative thinking among electrical men (Journal of Electricity, June 1, 1925, p. 538).

The medal was presented at a dinner at the Waldorf-Astoria Feb. 8 at which many men prominent in the electrical industry were present. W. W. Freeman, president of The Society for Electrical Development, was chairman of the dinner committee and acted as toastmaster. Owen D. Young, H. L. Doherty, J. H. McGraw and J. Robert Crouse were among the speakers.

Of particular interest to electrical men of the West is the fact that a certificate of honorable mention has been awarded to Clyde L. Chamblin, president, California Electrical Construction Company, San Francisco, in recognition of his untiring efforts in the cause of the electragists in California who, as the California Electragists, comprise the largest state association of electragists in the United States. Mr. Chamblin is a member at large of the executive committee of the N.E.L.A. elected to represent the electragists. For the past three years and a half he has been a member of the executive committee, Association of Electragists, International, and a director of The Society for Electrical Development. He is also a member of the advisory committee of the California Electrical Bureau. In addition, he is a past president of the San Francisco Association of Electrical Contractors and Dealers, as well as a past president of the state association.



New unit being erected for the Electrical Products Corporation in Oakland, Calif., by the Austin Company of California.

Dealer Merchandising Meetings Sponsored by Jobber

In an effort to bring about a better understanding of merchandising problems by electrical dealers, the Illinois Electric Company of Los Angeles is sponsoring monthly meetings at which these problems are discussed.

All electrical dealers and their wives are invited to attend a dinner preceding the meeting as the guests of the Illinois Electric Company. This is served in the cafeteria of the Westinghouse Electric & Manufacturing Company, in whose building the meetings take place.

The meetings are held on the third Tuesday of each month and are noncommercial in nature. The programs are in charge of the following committee: D. C. Pence, Illinois Electric Company; Walter Norton, Norton & Norton, electragists; J. A. Jamison, Westinghouse Electric & Manufacturing Company, all of Los Angeles; and J. J. Farley, Farley Electric Company, electragist of Fullerton.

Two window displays are set up in front of the hall in which the meetings are held. These serve as suggestions which may be used by the dealers. Some timely subject is discussed by a competent authority at each of the meetings, after which the floor is open for discussion of any problem.

"Present Day Merchandising" was the subject discussed by Harry Tuttle of the Parmelee-Dohrmann Company of Los Angeles at the January meeting, which was attended by 95 persons. Mr. Tuttle contrasted merchandising methods of today with those of a few years past and the corresponding advances made by co-operative associations.

He stated a merchant without fixed policies is like a ship without a rudder—he doesn't know where he is going; further, that the American business man has learned the power of co-operation, and that many stores fail because of a lack of co-operation rather than a lack of capital. He also spoke of the necessity of merchants keeping abreast of the times.

Electric refrigeration also was discussed in his talk. Mr. Tuttle stated that up to 1925 a total of 67,000 electric ice machines had been installed in homes in the United States. In 1925 250,000 were installed, and the quota for 1926 is 1,000,000 machines.

Jacobs Power Bill Defeated in Washington Senate

The Jacobs Power bill has been defeated in the Senate of the Washington State Legislature by a vote of 25 to 14. It previously had passed the House by a vote of 50 to 42. (Journal of Electricity, Jan. 15, p. 70.)

The measure provided that cities in the state be allowed to sell electric energy without their corporate limits, paying a tax of 5 per cent on all power sold.

Permit Granted for Hydroelectric Project in Wyoming.—Permit has been granted by the state of Wyoming to the Seminole Power Company for the construction of a hydroelectric power plant on the North Platte River, 40 miles north of Fort Steele, Wyo. Plans call for a dam 150 ft. high to form a reservoir of 700,000-acre-ft. capacity and a diversional tunnel 2 miles long.

Portland Company to Install New 20,000-kw. Steam Unit

One of the principal items in the 1926 budget of the Portland Electric Power Company, Portland, is to cover the installation of a new 20,000-kw. Curtis steam turbo-generator at Station "L," the main steam plant of the company in the city. The order for this unit has been placed with the General Electric Company, and it is planned to have it installed before the heavy load of next fall comes on. This will be the largest and most economical steam unit on the system.

The generator is a type ATB-4, 23,000-kva., 1,800-r.p.m., 11,000-volt, 3-phase, 60-cycle machine, and is self-cooled by means of a closed system of ventilation utilizing 50,000 cu. ft. of cool air per minute. Direct-connected to the main shaft is a 135-kw., 1,800-r.p.m., 250-volt exciter. The turbine has eight stages and operates at a throttle pressure of 175 lb. per sq. in. with a temperature of 550 deg. F.

An interesting feature of the turbine is that while it is designed to operate at low pressure at first, using surplus steam from the present boilers at 175 lb. pressure, it readily can be changed to use a pressure of 385 lb. at the throttle. Such change in operating conditions is contemplated in the plans for expansion of this station in 1927 when the boiler capacity is to be increased. This change in the turbine will reduce the steam consumption from 11.85 lb. per kw-hr. to 9.8 lb. per kw.-hr. at the most efficient point of operation.

Great Western Company's 1926 Budget Is $11,558,000

The Great Western Power Company of California will spend during 1926 $11,558,000 in the operation of its properties and for new construction projects, according to a statement made by J. B. Black, vice-president and general manager of the company. New construction work now in progress or to be commenced during the year is estimated at $8,611,000.

Included in the major construction projects to be undertaken or completed during the year is the raising of the Big Meadows dam in Plumas County 45 ft. and its extension in thickness from 600 to 1,250 ft., increasing the capacity of Lake Almanor from 300,000 acre-ft. to 1,300,000 acre-ft. This work includes the construction of a large concrete spillway, an outlet conduit beneath the dam to permit the drawing off of water into the Feather River below and an electrically operated outlet tower. The cost is set at approximately $2,000,000.

An additional $2,000,000 is required for the construction of a 220-kv. steel-tower transmission line between Brighton substation, near Sacramento, and Merced, interconnecting the Great Western system with that of the San Joaquin Light & Power Corporation. This line will be 104 miles in length and will carry ultimately two three-wire circuits, operating at 220 kv., but initially will be operated with one circuit. The new Wilson substation, which will be built at the southern terminus of the tie line, will cost an additional $700,000. This substation will be equipped with modern self-cooling transformers having a capacity of 60,000 kva. and a condenser whose capacity is 25,000 kva.

A new automatic substation will be erected at Isleton and interconnected with the company's two large substations at Brighton and Oakland. The cost of this substation will be about $206 000. Transformers having a capacity of 9,000 kva. will be installed.

An extension to the present Fourth Avenue substation in Oakland and the addition of new transformers and switching apparatus calls for an expenditure of $150,000, and the installation of an additional bank of transformers at Golden Gate substation will require $50,000.

Miscellaneous additions and betterments to the company's distribution substations will cost $1,350,000, and the construction of new distribution lines during the year throughout the company's entire territory is estimated at $1,500,000. The new budget calls for an expenditure of $2,947,000 for the operation of the company's production, transmission and distribution system, taxes, and commercial and new business activities.

During 1925 the Great Western Power Company added 5,000 new consumers to its lines, and now is serving a total connected load of 514,972 hp., representing an increase over the previous year of 45,000 hp.

San Joaquin Corporation Budget for 1926 Is $12,372,000

An announcement made by A. Emory Wishon, vice-president and general manager of the San Joaquin Light & Power Corporation, Fresno, Calif., states that an operating and construction budget for 1926 of $12,372,000 has been approved by officers of the Western Power Corporation and the North American Company, holding companies of the San Joaquin utility. (Journal of Electricity, Sept. 15, 1925, p. 222.) Mr. Wishon recently returned from New York where he conferred with officials of the two latter companies.

Of the amount set, $2,789,000 is allocated to the Kings River hydroelectric development. Work is now under way on the Balch plant, the first power house to be built on this project (Journal of Electricity, April 1, 1925, p. 241). In this plant, which will have an initial capacity of 33,000 kva., double over-hung impulse water wheels will operate under an effective head of 2,400 ft. The plant is scheduled for completion by January, 1927, and the cost is estimated at $5,000,000.

Almost a million dollars is to be spent on transmission lines. Included in this is $172,000, the cost of the 28-mile 110-kv. line to be built from Kerckhoff powerhouse to Sanger. This line will have 21 miles of steel pole and 7 miles of wood-pole construction. It is to parallel the present 110-kv. line and is to be rushed to completion to enable the corporation to meet the anticipated demands for additional power and service caused by the increase in the amount of acreage expected to be brought under cultivation in the San Joaquin Valley during 1926. A second transmission line, 12 miles in length, costing $94,000, is to be constructed from Piedra to Sanger to transmit power to be generated at Balch powerhouse. Improvements and extensions of the distribution lines and equipment call for $1,800,000, while approximately $1,000,000 will be spent in the construction of substations throughout the company's system.

Submarine Cable Will Be Laid Across Puget Sound

Breaking all previous records, considering the combination of length, power capacity, voltage and depth of water to be traversed,—in some places over 750 ft.—the Puget Sound Power & Light Company, Seattle, has placed an order with The Okonite Company of Passaic, N. J., for 46,800 ft. of three-conductor submarine armored cable. This will be used to span Puget Sound between Edmonds on the mainland side and President's Point on the Olympia peninsula.

Connection then will be established with the properties which the Puget Sound Power & Light Company recently acquired on the peninsula. In order to assure continuity of service and an ample supply of power, two cable connections between the points will be made. Each cable will be 23,400 ft. long, each capable of carrying 10,000 hp. From President's Point a junction will be made with the existing high-tension transmission near Bremerton.

The cable will weigh about 15½ lb. per foot, or a total of approximately 750,000 lb. It will require nineteen carloads of cable, which will be delivered in lengths of 2,700 ft. There will be seven splices in each completed span. All of these will be made ashore, and each span lowered by means of a power hoist. It is expected that the cable will be delivered in May.

Power Project Contemplated on Cle Elum River, Wash.

A new $1,000,000 power project for Kittitas and Yakima Counties, in the central part of Washington, is outlined in an application just filed with the state hydraulics department by Pearl E. Richards of 116 Perkins Building, Tacoma, as the Kittitas Power Company.

This project, to develop 8,000 hp. and utilize a fall of 94 ft., calls for the appropriation of 1,000 sec.-ft. of water from the Cle Elum River, and would require the construction of a concrete dam 95 ft. high at a point on the river now designated as Little Salmon Lasac.

It was indicated further that in this undertaking, for which Robert Young of Tacoma is to be superintending engineer, the flood water backed up by the dam would cover 331 acres and would entirely overlap Waptus, Fish and Cooper Lakes now in the area intended for use as a reservoir.

In the application it was stated that the power used would be carried by transmission lines to all cities and towns in a large radius, there to be used for lighting, heating, mining and for other industrial and domestic uses.

Puget Sound Utility Proposes Connection with Kittitas Company Lines.—The Puget Sound Light & Power Company through its Ellensburg, Wash., branch, proposes to build down the west side of the Yakima River from the South Cle Elum substation, through Thorp and connect with the line of the Kittitas Power & Light Company, extending its lines where there is sufficient business to justify the extension. It is planned that eventually the whole lower valley, exclusive of Ellensburg, will be given service by the Puget Sound company.

Profitable Committee-Section Conference Held by Rocky Mountain Division

That the first-hand discussion of problems and the mutual exchange of information is helpful in high degree was indicated at the recent committee and section conference of the Rocky Mountain division N.E.L.A., which was held for the first time at Idaho Springs, Colo., late in January.

While a certain amount of discussion is developed on convention programs the main vehicle provided by the organization officers is the individual speaker. Reports from the Idaho Springs conference indicate that the speakers served simply as leaders of discussion, which was predicated on surveys, investigations, reports and questionnaires. Because of the practical value of this material, both to large and small power companies, the results of the meeting, according to officials, will be reflected in the change of some established policies and the development of new ones.

Of chief interest in this line was the discussion on accounting policies affecting public relations as led by John E. Loiseau, secretary of the Public Service Company of Colorado and chairman of the division accounting section. As a result certain practices seemed advisable, such as to accept service applications by telephone, the contract to be signed later; to require a meter deposit of at least five dollars unless the applicant had established credit; and to eliminate the personal guarantor on the fact that the applicant was a property owner. When credit had been established, as in other commercial lines, or successful experience was obtained for at least one year, it was recommended that the deposit be returned with interest, covering, however, a period of not less than six months. While monthly billing was the accepted practice, it was pointed out that bimonthly or even tri-monthly readings were working out satisfactorily, especially in certain rural districts.

J. A. Clay, general manager of the Western Colorado Power Company and chairman of the commercial section, headed the commercial program. Mr. Clay previously had attended the Commercial National Section meeting in Chicago and was also present at the range and rural lines committee meetings held in Salt Lake City early in January. G. B. Buck, of the Public Service Company of Colorado, outlined the necessary program for active central-station commercial development.

Due to the fact that all reports and committee meetings were held consecutively, every attendant was a party to all considerations. Non-technical men were interested auditors in the technical section presentation led by Harry Kerr of the Public Service Company. Overhead line crossing agreements with railroads were outlined, and it was the sense of the report that the power companies of the region, and in fact of the entire country, had been too easy in their relations with railroads on this matter, and a more equitable agreement was recommended. The effect of radio interference on the public relations of a central station was discussed, and the methods employed by the Denver company to overcome difficulties in this line were reported. The test set employed to trace interference also was demonstrated. The income from radio both direct and indirect, was emphasized as sufficient reason for the incurrence of expense in helping to improve radio reception of customers, regardless of cause.

W. C. Sterne presided at the public relations session. Emphasis was given to the work being done by the Rocky Mountain Committee on Public Utility Information.

Higher wiring standards and the necessity for central stations assuming the lead in such community development was stressed by S. W. Bishop, chairman of the division wiring committee. Owing to ignorance and the absence of wiring regulations outside of metropolitan centers, the uniform ordinance was suggested for operation with the National Electrical Code. Several companies voluntarily offered to back movements in their territories looking toward the establishment of some kind of wiring inspection.

Preliminary plans for the annual division convention at Glenwood Springs next September were discussed. E. A. Phinney, head of the Jefferson County Power & Light Company, Golden, Colo., again was named general convention chairman with O. A. Weller, division secretary, as program chairman and Mr. and Mrs. John J. Cooper in charge of the entertainment.

All of the larger Colorado central stations were represented at the meeting and a large representation was present from both New Mexico and Wyoming. Charles A. Semrad, general commercial manager of the Public Service Company of Colorado, and president of the Rocky Mountain division, was the general chairman of the meeting.

News Briefs

Mountain States Power Company Buys Plant at Libby, Mont.—The Libby Water & Electric Company, Libby, Mont., has been acquired by the Mountain States Power Company, a Byllesby holding. It will be operated as part of the Mountain States company's system, which serves seventy-four communities in Oregon, Washington, Wyoming, Montana and Idaho.

Los Angeles to Spend $6,000,000 for Ornamental Street-Lighting Systems.—More than $15,000,000 will be expended in Los Angeles during 1926 in the erection of various municipal structures and city improvements, according to a report issued by the municipal art commission of that city. Of this sum approximately $6,000,000 is to be spent for ornamental street-lighting standard systems and almost $500,000 for additional buildings for the Bureau of Power and Light.

Electric Manufacturing Company Holds Sales Conference.—The Benjamin Electric Manufacturing Company, Chicago, held a three-day sales and advertising conference at its main office in that city Feb. 4-6. Sales plans developed and approved include an extensive advertising program for the fiscal year beginning April 1. Trade and class publications, national magazines and newspapers will be used as well as a complete schedule of direct sales promotion literature, with dealer, contractor and other selling helps. Miles F. Steel, manager, Pacific Coast division, San Francisco, was among those who attended the conference.

New Dispatching Center Installed by Southern California Edison Company.—A new dispatching center has been established by the Southern California Edison Company at its Vestal substation. A separate building has been constructed for the purpose of housing the dispatching office and equipment. This building is immediately in front of the main substation building, and its archtecture conforms to that of the main substation building. The duties of the dispatching force located in the new building will be distinct from those of the operators at the substation. This new office will handle the San Joaquin Valley lines of the company and will relieve the central dispatching office in Los Angeles of many details.

Asks Franchise for Power Line from Crestline to Arrowhead Lake, Calif.—Fred D. Cats of Crestline, Calif., has filed a petition for a franchise to build a power line to extend from Crestline to Arrowhead Lake. The proposed line will run along the crest of the San Bernardino range and will serve the hundreds of cabin owners and resort operators in that territory. The Arrowhead Lake Company has its own power line, but Mr. Cats states that he has permission to extend his line into their territory. Mr. Cats has asked that the franchise run for fifty years. The Board of Supervisors of San Bernardino County is making an investigation of the request.

B.C. Company to Increase Storage Capacity at Jordan River Plant.—The British Columbia Electric Railway Company has announced that it will spend $100,000 in increasing the storage capacity and in doubling the size of the flume at its Jordan River plant, at the southern end of Vancouver Island, so that it may be fully prepared in emergencies, such as the prolonged drought of last fall, when for several weeks it had to bring the auxiliary steam plant at Brentwood into service.

First Electrical Gold Dredge Put in Operation in Washington.—The first electrically driven gold dredge put in operation in the state of Washington has been installed by the Kittitas Mining Company on its property at Swauk Creek near Ellensburg. It will displace the hand labor that has been used in gold dredging in that section for fifty-six years. The dredge handles 5,000 cu. yd. of gravel in twenty-four hours and cost $250,000. Three more electrically driven dredges will be installed by the company in the near future, C. A. Johnson, president, states.

Northwest Electric Light & Power Association

Many Topics Discussed at General Group Meeting of Accounting Section

Discussing the theory and practice of accounting methods with a view to developing material from which to compile final reports of the various committees, the Accounting Section held a general group meeting in Portland, Feb. 1, 1926. Forty odd members of the section were present. A resolution commending the section chairman, A. J. Johnstone, auditor, Portland Electric Power Company, Portland, on the excellent manner in which he conducted the meeting and directed orderly discussion was passed.

The meeting was opened by a report of the Stores and Purchasing Committee, read by J. S. Ruppe, general storekeeper, Puget Sound Power & Light Company, Seattle, in the absence of the chairman of that committee, F. W. Brownell, comptroller of the same company. The subject was, "Inventory of Material and Supplies," and this subject was narrowed down to a description of a suitable method of taking an annual physical inventory, pointing out some of the advantages to the accounting officer, and some of the uses to which the data collected might be put by other officers and department heads of the company.

Explaining that the fixed capital committee of this geographic division had been assigned by the national committee the subject of transmission and distribution line records, its chairman, J. A. Rockwood, valuation engineer, Portland Electric Power Company, Portland, presented a report outlining a process whereby the average cost of various units entering into the construction of these lines could be arrived at for the purpose of reaching a correct figure at which to retire any portion of the property when it was taken out of service.

The adaptability of machines to accounts payable records and payroll records, was the subject of a report read by F. H. Anderson, assistant treasurer, Puget Sound Power & Light Company, Portland, chairman of the Accounts Payable Committee. This report indicated that tabulating machines, with sorter, punches and cards were adaptable to handling a mass of data calling for various classifications, with accuracy, speed, and with less expense than is possible by hand.

The afternoon session was opened by a talk by F. L. Nagel, supervisor of credit department, Portland Gas & Coke Company, Portland, on the system of exchange of credit information as used by the Pacific Coast Gas Association. Under this system every applicant for service is asked of what other utility company he was last a customer, and an inquiry is sent to that company as to the status of his credit with it. If the reply is satisfactory the customer is not asked for a deposit but is assumed to have established credit. Mr. Nagel stated that the use of this system by the Portland Gas & Coke Company had been influential in keeping credit losses at a minimum. The subject was widely discussed, and consensus of opinion indicated that the system should be adopted generally among utility companies and that it would work. The public relations aspect of the question was touched on by D. J. Torrence, assistant to comptroller, Puget Sound Power & Light Company, Seattle, who urged that any system which successfully could replace the deposit system would generally be appreciated by the company's customers, to the benefit of the company's relations with those customers.

In lieu of a regular report from the Statistical Methods Committee by its chairman, W. H. Hawkes, Puget Sound Power & Light Company, Olympia, Wash., who was absent, D. F. McCurrach, rate and valuation engineer, Northwestern Electric Company, Portland, member of the committee, gave a talk on the application of charts and curves to statistical reports. As an added contribution on the general subject, W. L. Fitzpatrick, general auditor, Mountain States Power Company, Tacoma, read a company report outlining the organization and work of the statistical division of the Northern States Power Company, a sister company to his own.

At this point, the regular program having been completed, the meeting was thrown open for a discussion of any subject desired. During the entire meeting discussion was widespread and spirited. Beside those already mentioned the following contributed informative material leading to the crystallization of opinion: H. L. McPherson, engineering accountant, Puget Sound Power & Light Company, Seattle; B. H. Parkinson, cost accountant, Portland Gas & Coke Company, Portland; M. J. Wilkinson, assistant secretary and assistant treasurer, Pacific Power & Light Company, Portland; I. D. Murfield, balance of stores clerk, Portland Electric Power Company, Portland; J. G. Hawkins, engineering accountant, Pacific Power & Light Company, Portland; A. D. Brown, chief clerk, central district, Puget Sound Power & Light Company, Seattle; C. P. Milne, credit man, Portland Electric Power Company, Portland; F. S. Grutze, credit man, Northwestern Electric Company, Portland; W. N. Ringrose, chief clerk, southwestern district, Puget Sound Power & Light Company, Tacoma; B. E. Lee, division auditor, Mountain States Power Company, Albany, Ore.; M. A. Preisz, auditor Eastern Oregon Light & Power Company, Baker, Ore.; and L. E. Hinman, assistant valuation engineer, Portland Electric Power Company, Portland.

Feb. 18-19 Set for Group Meeting of Commercial Section

A group meeting of the Commercial Section of the Northwest Electric Light and Power Association will be held in Spokane, Feb. 18-19 at the Davenport Hotel, according to announcement of P. M. Parry, commercial manager, Utah Power & Light Company, Salt Lake City, and chairman of the section.

Representatives of all branches of the industry—manufacturers' agents, jobbers, contractors, central station men—have been invited to attend, and it is hoped that a representative of the Commercial National Section will be present. Many suggestions which cannot be considered in a general session will be discussed, and the chairman is anxious to have a full attendance at the meeting.

Women's Committee Meeting Has Home-Lighting Program

More than sixty-two women attended an interesting meeting of the Women's Committee of the Northwest Electric Light and Power Association held at Spokane, Wash., on Jan. 19, when W. R. Matthews, illuminating engineer of The Washington Water Power Company, presided at a program on home lighting.

The company's assembly room was arranged to show the proper methods of illuminating a dining room, living room and kitchen. Mr. Matthews demonstrated the types of fixtures, and with the use of a shadow box holding a bust of Shakespeare showed the effect of light thrown from different directions. He also illustrated by means of a speed-of-vision machine arranged in the form of a drum the effect of proper light upon the vision.

Industrial Lighting Competition Prizes and Judges Named

The industrial lighting committee of the National Electric Light Association next spring will award three prizes to the three electrical leagues or electric service companies which, in the opinion of that committee, shall have done the best work along the lines which the committee is promoting. The period covered runs from Sept. 1, 1925, to March 1, 1926. Reports must be in the offices of the committee at N.E.L.A. headquarters in New York by April 1, 1926. The prizes are for $2,500, $1,500 and $1,000, respectively, and the winners will be announced at the N.E.L.A. convention at Atlantic City in June.

The judges selected are: chairman—Earl E. Whitehorne, commercial editor, Electrical World, New York; James E. Davidson, president, National Electric Light Association, and vice-president, Nebraska Power Company, Omaha; Edward W. Lloyd, chairman Commercial Section, N.E.L.A., and general contract agent, Commonwealth Edison Company, Chicago; Dugald Jackson, professor of electrical engineering, Massachusetts Institute of Technology; and Merritt Lum, vice-president, A. W. Shaw Company, Chicago, publisher of Factory.

Pacific Coast Electrical Association

Advertising Section Reorganizes at Fresno Meeting

When the committee on standards of the Advertising Section, P.C.E.A. made its report to the section at its meeting in Fresno, Feb. 5, the section adopted that committee's recommendation for a new form of organization and immediately placed itself under it. Action was taken after considerable discussion of the new organization form proposed.

Declaring that it was necessary for the Advertising Section to define concisely its scope of activity with respect to the Public Relations and the Commercial Sections, and recommending that a permanent and yet flexible organization be adopted and incorporated in a code book, the standards committee's report brought forth much discussion. It was presented by Ben Allen, chairman of the committee, and read by W. A. Cyr, a member of the committee.

The new organization form proposed and adopted calls for an executive committee consisting of the section chairman, the vice-chairman and the past chairman, the latter provision to enable a continuous policy to be pursued. Under this plan Dan Scott, Los Angeles Gas and Electric Corporation, chairman; M. S. Scanlon, Westinghouse Electric & Manufacturing Company, vice-chairman; and Al Joy, San Joaquin Light & Power Corporation, past chairman, constitute the new executive committee.

This committee is charged with the assignment of subjects for study and papers, the assignment being made whenever subjects requiring consideration are brought to its attention. This organization does away with a superstructure of committees and subcommittees, and assigns to individual members of the section the responsibility of getting up papers on subjects assigned them, giving them the liberty to call on any other member of the section for advice and assistance.

The new organization also calls for a standards committee to act in a judiciary and advisory capacity, passing upon such changes to the organization or standards of practice of the section as are required in the light of the code to be established by it and submitted to the section for approval. Impartial judgment of the value of questionable advertising media is also to be undertaken by this committee. Its personnel consists of three members, one appointed each year, the senior member being chairman. This plan was adopted in order to give continuity of policy and interpretation to the section's code. Ben S. Allen, Key System Transit Company, was appointed senior member and chairman of this committee, Wm. A. Cyr, Journal of Electricity, two-year member, and J. Charles Jordan, Pacific Gas and Electric Company, the three-year member of the committee.

A third committee, on information, was named in the new organization, with Frederick S. Myrtle, Pacific Gas and Electric Company, as chairman.

The next meeting of the section will be in San Francisco, April 3, at which time the standards committee is to report in full as to the code it proposes for the section.

Members Must Notify Secretary of Address Changes

All members of the Pacific Coast Electrical Association are not only requested but urged to advise this office of any change of address so that our lists may be absolutely correct and up-to-date. Members should likewise inform us immediately of any and all changes in the future. If members will only let us know when they move or change their address, there would be fewer Journals returned by the post office department and it would simplify the problem of mailing out the books of Proceedings, as well.

SAMUEL H. TAYLOR,
Secretary.

Coast Well Represented at the Kansas City Meetings

Eight delegates from the Technical Section of the Pacific Coast Electrical Association attended the group meetings of the Technical National Section in Kansas City, Feb. 9-12. But for the illness of L. J. Moore of the San Joaquin Light & Power Corporation the total number would have been nine. J. G. Rollow, vice-chairman of the P.C.E.A. Technical Section, attended the meetings of the underground and the apparatus national committees and acted for R. R. Cowles, chairman of the P.C.E.A. Technical Section, who was unable to go East for these meetings. R. G. Jones, chairman of the P.C.E.A. meter committee, attended the meters and accident prevention national committee meetings; J. C. Gaylord, chairman of the P.C.E.A. apparatus committee, attended the meetings of the apparatus and the hydraulic power national committees. Clinton de Witt represented Walter Dreyer, chairman of the P.C.E.A. hydraulic power committee, at the meetings of the national committee of that name. F. G. Philo attended the national prime movers committee meeting in the place of J. W. Andree, chairman of the P.C.E.A. prime movers committee. Others attending from the Coast were H. Michener and R. J. C. Wood, of the Southern California Edison Company, who are members of the national overhead systems committee, and H. H. Buell, secretary of the P.C.E.A. underground systems committee, who attended the meetings of the national underground and the national inductive co-ordination committees.

This delegation gave the Pacific Coast an excellent representation at the group meetings where they took full part in discussions and activities. The P.C.E.A. Technical Section thus had a representation of two members on each national committee, except the overhead committee where the representation was three.

Transportation Section Outlines Activities at Meeting

Maintenance, operation and practices relative to transportation vehicles of utility companies are the major problems to be considered by the Transportation Section of the Pacific Coast Electrical Association, as outlined by S. B. Shaw, chairman, at the meeting of the section held at the office of the San Joaquin Light & Power Corporation in Fresno, Jan. 29-30.

It is planned to prepare a summary of practices as followed by member companies. Papers will be prepared on the following subjects: tires, body design and selection of equipment, repair shop methods, lubrication, garage design, records and accounting, power equipment, educational methods, and electric trucks.

The electric truck committee, a subcommittee of the Commercial Section of the P.C.E.A., has for its work the consideration of the commercial aspects of the electric truck. In view of this fact the Transportation Section will consider gas vehicles in the majority of its papers; however, it will consider the maintenance and operation of the electric truck.

The next meeting of the Transportation Section will be held in San Francisco, April 23-24.

Additional Reports of January Technical Conclave

Electrical Apparatus Committee

J. C. GAYLORD, Southern California Edison Company, Los Angeles, Chairman.

Considerable attention was given to the trend of Pacific Coast practice in substation design. Several papers on this subject were read and discussed. Standardization of general substation layout was evident in the designs adopted by the various operating companies. One company representative described a layout which permits the gradual expansion by successive steps of a small rural station fed at 70 kv. and supplying one or more 11-kv. feeders to a station fed by one or more 110-kv. lines and supplying a 70-kv. network and several 11-kv. feeders. This was accomplished by designing the original installation with expansion in view of utilizing standard structures and equipment.

There also was a tendency shown in all the papers to get away from the installation of large storage batteries in outlying stations with their attendant high initial cost and high upkeep. Two of the operating companies are using air control of oil circuit breakers, air compressors being operated from small storage batteries of from 13 to 32 volts. One company is using a motor-operated spring mechanism running on a 24-volt storage battery.

A paper describing the new Wallenpaupack hydroelectric development of the Pennsylvania Power & Light Company was read and discussed. This

project contrasts markedly with practice on this coast. Power generated at the Wallenpaupack plant by two 25,000-kva. generators is transmitted at 220 kv. for only 65 miles before being stepped down. This hydro plant is designed as a peak-load plant for a 25 per cent annual load factor, the base load being carried on steam.

In discussing oil circuit breakers the danger of over-investment in this class of equipment was pointed out. This may be avoided by specifying switches capable of rupturing short circuits under average probable conditions rather than the maximum currents obtainable. In order to secure more dependable information on the behavior of various makes and types of switches in actual service an extensive survey covering the actual performance of their breakers is now being carried on by all of the member companies.

A joint session was held with the overhead systems committee and the safety rules committee at which were discussed problems of common interest, including grounding and the adoption of standard distribution transformer ratios. It was pointed out that, in the recommendations of the subcommittee of the national apparatus committee which studied this matter, no provision was made for the inclusion of a 4-kv. class of transformers. Also it is desirable that transformers be included of such a ratio that they may be used for single-phase service on a star-connected distribution system and give the same secondary voltage when connected across phases as that given by a star-connected three-phase bank. It was recommended that these facts be brought to the attention of the national subcommittee.

Inductive Co-ordination Committee

H. N. KALB, San Joaquin Light & Power Corporation, Fresno, Chairman.

Recent inductive co-ordination cases were discussed. Of particular interest was the proposed 104-kv. Manteca-Salinas line being constructed by the Pacific Gas and Electric Company, lessee of the Sierra & San Francisco system. Through Pacheco Pass some high elevations are encountered. Therefore in this section flat construction is interspersed with triangular (wishbone) construction. This offers unique problems in the arrangement of transpositions.

P. E. Chapman, Pacific Gas and Electric Company, San Francisco, reported by letter on the national committee meeting held in Detroit in October. The outstanding points discussed at those meetings were joint use of poles, radio interference, space radio wave bands and the new systems of automatic train control. In discussing the latter feature, L. J. Corbett, Pacific Gas and Electric Company, San Francisco, stated that he had found that none of the roads in the local territory yet were installing the "continuous inductive" type which is the most susceptible to outside influences. The "intermittent inductive" type is being installed most generally and is not affected particularly by stray induction.

Radio interference was the subject of written and verbal reports and discussion. A paper by J. J. Jakosky, Western Precipitation Company, Los Angeles, relating particularly to installations of Cottrell precipitation apparatus was quite comprehensive. It was questioned whether the superheterodyne set after all was the best set to use for locating faults causing radio interference as the three-tube regenerative set with broader tuning is satisfactory in most cases. The advantage of the superheterodyne is that it is as sensitive as the best sets of the complainants while the three-tube set may not detect the troubles complained of by owners of the better sets. The desire for accurate costs of radio interference detection and correction was stressed although the difficulties of the accounting were appreciated.

Wire communication was reported upon and discussed. This involved methods of protection and transposition and maintenance of "hot" and "cold" telephone lines. Acoustic shock suppressors of the vacuum tube type are used to some extent by the San Joaquin Light & Power Corporation and by the Southern California Edison Company with evident success. The latter company reported use of telegraph signals which are utilized between phantom and ground on certain lines. The Southern Sierras Power Company uses the phantom for this purpose.

Carrier communication on power wires is in use by the Bureau of Power and Light, the Great Western Power Company and the Pacific Gas and Electric Company, the latter two having equipment made up on the ground and the former using Western Electric equipment. The Pacific Gas and Electric Company's set is simplex in operation and thus not ideal for the service desired. Therefore a trial is to be made of the products of three different companies of which the one found to be best suited for the conditions will be retained. None of the western companies is using carrier current on telephone lines.

The matter of supervisory control, just taken up by the committee, was discussed. A joint committee between the inductive co-ordination and apparatus committees will be appointed to investigate and report on this subject.

Company Allowed to Change Pit River Development Tunnel

Permission recently granted by the California Railroad Commission to the Pacific Gas and Electric Company, San Francisco, to change its tunnel plans for its additional Pit River developments will result in securing more favorable dam sites and power-house sites for plants Pit 4 and Pit 5 and in shortening the length of Pit 5 tunnel by 1½ miles. Under the original plans the Pit 5 plant would have required a 7-mile tunnel.

Other advantages, according to a statement issued by the company, are that more water will be available for power generation through Pit 6 plant from several tributary streams which enter the Pit below the Pit 5 diversion; that the head of 595 ft. on Pit 5 will permit of the use of the most efficient type of reaction turbine, whereas the head of 980 ft., as originally planned, would have necessitated the use of impulse wheels; and that power may be developed in blocks more nearly suited to meet the growth of the company.

"What Price Light" Given First Performance at Sacramento

"What Price Light," a realistic playlet prepared by the Industrial Lighting Committee, N.E.L.A., was given its first Western performance at the regular meeting of the Sacramento Valley Electrical Society Jan. 13. The performance was sponsored by the northern division, Pacific Coast geographical division, of the Industrial Lighting Campaign, headed by C. D. Montieth and H. H. Allison, vice-chairmen.

The cast was made up from members of the San Francisco chapter of the Illuminating Engineering Society. Robert St. John, of Simonson & St. John, consulting engineers, played the part of the Factory Superintendent, harassed by low production, high spoilage, and many accidents in his poorly lighted plant. His Plant Electrician, satisfied with a 60-watt lamp over every machine, was played by O. K. Jones, of the Great Western Power Company. The Breezy Salesman, who tries to load the superintendent up with a trick lighting fixture, using high-pressure methods, was played by W. A. Cyr, of the Journal of Electricity. The Engineering Salesman, who shows all the salient facts about lighting and sells a true lighting service, was played by Leo Gianini, Edison Lamp Works.

The playlet was produced in San Jose Feb. 4 before the Santa Clara Valley Electrical League and will be given in San Francisco before the San Francisco Electrical Development League on Feb. 15.

A.I.E.E. News

Los Angeles Section has a "triple-header" for the regular meeting to be held March 2, 1926, at the banquet hall of the L. A. Creamery at 1120 Towne Avenue. All three speakers are members of the Southern California Edison Company's staff. N. B. Hinson, planning engineer, is to speak on "Forecasting Growth of Population, an Aid to System Planning;" E. R. Stauffacher, protection engineer, is to tell of "Application of Protective Equipment to Electric Transmission Systems;" and F. G. Philo, superintendent of steam generation, is to give a review of the "Progress in Steam Generation of Power and the Mercury Turbine."

San Francisco Section. Feb. 26 meeting will be addressed by P. J. Ost and N. A. Eckhart, of the engineering department of the city of San Francisco, who will discuss the Moccasin Power development. The meeting will be held in room 251 at the City Hall and will be preceded by a group dinner at the Whitcomb Hotel at 5:45 p.m. An interesting evening is assured.

Farley Osgood, past president of the Institute, has announced that a portion of his time now is available as a consultant on the design, construction, operation and interconnection of public utilities. Mr. Osgood will have offices in the National Bank of Commerce Building in New York City.

News of the Electragists

Throwing string confetti on board the boat bound from the Catalina convention of the Electragists. From left to right: Victor Lemoge, San Francisco; Harry Walker (president of the California Electragists), Los Angeles, and Frank McGinley, Wilmington.

Some of the men in attendance at the Catalina convention enjoyed a little fresh air in the grounds of the Hotel St. Catherine while waiting for the general meeting to convene. The smiles are evidence of the enjoyable time they are having.

Plans Outlined for State-wide Meeting in Denver Mar. 26

A state-wide meeting, primarily intended for contractors and dealers of Colorado, but with the support of the entire industry, is scheduled to be held in Denver March 26 under the sponsorship of the Electrical League of Colorado.

Following the practice of other Western leagues, the idea of holding a one-day convention has been developed in order to bring all branches of the industry together and especially those agencies not directly identified with existing organizations, according to A. C. Cornell, chairman of the league.

The program committee, headed by L. M. Cargo, intends to have one or more speakers of national reputation and other interesting features that will insure a large attendance.

W. A. J. Guscott, president of the Denver Electrical Contractors Association and a vice-chairman of the league, is head of the committee promoting a good attendance for the meeting. The contractors plan to have a round table luncheon discussion of their problems. A banquet with special entertainment will be featured at night.

Although formal invitations will not be issued notices will be sent to all of the electrical men in Colorado and in case any do not receive proper notification, officials of the league want every electrical man to feel that he is invited. While the meeting is primarily intended as a Colorado affair, it is hoped that representatives from Wyoming and New Mexico and other Western states will be present.

Bureau Sponsors Meeting of Contractors and Inspectors. — Interpretations of the National Electrical Code were discussed by the city inspection department and the electrical contractors of San Diego at a meeting sponsored by the California Electrical Bureau. At this meeting plans of closer co-operation between the various contractors and the inspection department were laid, and arrangements were made for holding weekly noon-day meetings of the two groups to discuss Code rulings and other subjects. The first meeting was attended by Harry N. Beecher, chief electrical inspector of Los Angeles, and James H. Evans, engineer of the Board of Fire Underwriters of the Pacific.

Clyde Chamblin will receive a certificate of honorable mention in connection with the James H. McGraw Award given "to encourage constructive thinking for the advancement of the electrical industry." This certificate has been awarded to Mr. Chamblin as a recognition of his work in extending the electragist movement to the State of California and also for his efforts in promoting the state-wide organization of the California Electragists, which is the largest state organization in the United States. Unfortunately Mr. Chamblin was unable to attend the presentation dinnner given in New York Feb. 8 at the Waldorf-Astoria and so Joseph E. Fowler, president of the Association of Electragists, International, acted as his proxy. Mr. Chamblin is the proprietor of the California Electrical Construction Company of San Francisco.

Northwest Association of Electrical Inspectors, Portland, Ore., Jan. 12, 1926. The two gentlemen in the center, evidencing the spirit of co-operation that permeated the convention by advertising the balmy quality of Portland's weather on that midwinter day, are H. A. Patton, Seattle, and George C. Nixon, Port Angeles, Wash.

Meetings

Red Seal Activities Main Topic at Bureau Meeting

Red Seal acctivities occupied the greater part of the time and attention of the advisory committee of the California Electrical Bureau at its meeting at the Jonathan Club, Los Angeles, Jan. 21.

After the meeting had been called to order and minutes of the last meeting had been duly approved, W. L. Frost, chairman of the finance comittee, made a statement to the effect that arrangements for providing funds for the business of the Bureau were proceeding satisfactorily and responses were coming in rapidly.

The chairman made a report on the status of plans for the prosecution of Red Seal activities, giving the results of his conference with W. L. Goodwin and F. M. Feiker of the Society for Electrical Development in New York City December last.

After a careful study of ready-made material which had been prepared by the Society for Red Seal activities, it was found that the greater part of it was inapplicable to meet the conditions involved in the state-wide organization in California. Suitable material for California use therefore was prepared by the Bureau staff, including a complete manual in mimeograph form, copies of which were submitted to the committee for inspection. It was reported further that orders had been placed for the necessary forms and printed material and that deliveries to district chairmen would commence about Feb. 1, when the Red Seal Plan would be ready to be put into effect without further delay.

Various suggestions were offered as to devising ways and means of giving premiums or awards of some nature to the district which made the best showing. These various plans were taken into consideration in order that they might be reduced to some practical working form.

The chairman was authorized by the board to employ F. J. Kiefer for service in the northern section of the state in furthering the objects of the Red Seal Plan.

During the afternoon session the question of advertising and publicity was taken up for discussion. The chair was authorized to appoint M. W. Scanlon, of the Westinghouse Electric & Manufacturing Company, as general chairman of the advertising committee with the recommendation that he build up his committee personnel using as a nucleus the advertising committee of the Pacific Coast Electrical Asociation, and be prepared to submit a detailed report at the next meeting of the advisory committee as to the form his committee's activities would take.

The report of the auditor on the books of the bureau was submitted and approved.

Frank J. Airey spoke of the opportunity afforded by contact with the Architectural Club in Los Angeles in order that the assistance of the bureau might be utilized in laying out wiring diagrams for publication in its books of floor plans. Similar contacts will be established with manufacturers of ready-cut homes and others engaged in the same line of business.

A discussion was held as to ways and mean of making an accurate survey of the number of electrical homes in the state of California to be published later in pamphlet form for the purpose of showing the people at large the degree to which the all-electrical home idea had penetrated this state and for the purpose of removing the bugbear of excessively high operating cost, which has acted as a stumbling block in the progress of this movement.

The meeting then adjourned to enjoy the hospitality of the southern members at a dinner served in the rooms of the new Jonathan Club.

COMING EVENTS

Commercial Section, Northwest Electric Light & Power Association—
Group Meeting, Davenport Hotel, Spokane, Wash. Feb. 18-19, 1926.

Technical Section, Northwest Electric Light and Power Association—
Annual General Meeting—Seattle, Wash. March 11-12, 1926

Executive Committee, Pacific Coast Electrical Association—
Meeting in office of William Baurhyte, President. Los Angeles Gas & Electric Corporation Building, Los Angeles. March 11, 1926.

Electrical Men of Colorado—
State-wide meeting under sponsorship of Electrical League of Colorado Denver, March 26, 1926

Technical Conclave, P.C.E.A.—
San Joaquin Power Building, Fresno, Calif., April 7-9, 1926.

Transportation Section, P.C.E.A.—
San Francisco, April 23-24, 1926.

Advertising Section, P.C.E.A.—
San Francisco, Calif., April 30, 1926.

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va. May 31-June 4, 1926

Pacific Coast Electrical Association—
Annual Convention—Biltmore Hotel, Los Angeles June 8-11, 1926

Associated Manufacturers of Electrical Supplies—
Annual Convention—Hot Springs, Va. June 7-12, 1926

National Electric Light Association—
Annual Convention—Atlantic City, N. J. May 17-21, 1926.

Confer on Construction of Lines to Rural Communities

Members of the National Electric Light Asociation committee on rural electrification held a conference in Salt Lake City Jan. 7. The session was held at the Hotel Utah, and technical matters relating to the construction of lines to rural communities in the United States were discussed.

G. C. Neff, vice-president of the Wisconsin Power & Light Company, Madison, Wis., chairman of the committee, presided. Other members in attendance were Dr. E. A. White of Chicago, director of the Committee on the Relation of Electricity to Agriculture; F. F. McCammon of Denver, Colo; Eugene Holcomb of Jackson, Mich.; J. B. Johnson of Elyria, Ohio; Arthur Huntington of Cedar Rapids, Iowa, and George T. Bragg, of Portland, Ore.

Jobbers Name New Officers at Del Monte Meeting

C. B. Hawley, of Salt Lake City, was elected chairman for the ensuing year by the Pacific Coast Electrical Supply Jobbers' Association at its regular quarterly meeting held at Del Monte, Jan. 28-30. O. B. Stubbs was named an executive committeeman and Albert H. Elliot was re-elected secretary of the organization in the election of officers.

At the open meeting an illustrated lecture on the "Lure of the Northwest" was given by Frank Branch Riley, of Portland, Ore., through the courtesy of Floyd Averill, of Fobes Supply Company, Portland.

Ray W. Murphy, of the Westinghouse Lamp Company, San Francisco, presided over the golf dinner given Saturday evening in his customarily gracious manner.

Book Reviews

ELECTRICAL ENGINEERING PROBLEMS

By JOHN G. PERTSCH, Jr., Professor of Electrical Engineering, Cornell University. Part 1, Direct-Current Circuits and Apparatus. First edition. 208 pages. 100 illustrations, 824 problems. McGraw-Hill Book Company, Inc., New York. $2.

This work is precisely what the title indicates, a set of problems. The book has been developed from a set of problems used by the author for some years in courses given to junior students in electrical and mechanical engineering at Cornell University. They are designed to give the student a set of exercises in which he may find practical application for the fundamental principles of electrical engineering.

Problems on electrical and magnetic circuits and their application to direct-current machinery are treated in this book. Alternating-current problems are left for a companion volume. The author has divided the 824 problems given in this volume into thirty grouping according to subject and ranging from the simplest power and energy problems to those dealing with electrical illumination. Problems are arranged progressively according to the author's idea of the importance of the subject, and the number of problems under each subject depends upon the importance of the subject.

The book should serve well as a suplement to a text or lecture course in direct currents. Its use as a source of problems for self-instruction would be limited, however, by the fact that no answers to problems are given, thus making it somewhat difficult for the individual student to check his own work.—G. R. H.

Personals

F. L. Brewer, since 1921 with the Mountain States Power Company, Albany, Ore., has been made sales manager of the merchandise department of that company, succeeding **F. E. McKenna,** who resigned to go into private business. Mr. Brewer was born at Marshall, Mich., where he completed his high school education. Entering

F. L. BREWER

the University of Michigan in 1917, he was graduated in 1921 in a general course. In September of that year he entered the employ of the Mountain States Power Company, Albany, as stockkeeper, and in the next four years was advanced through several positions, including cashier and salesman, until August, 1925, he was promoted to his present position. Later in the year, when the general offices of the company were moved to Tacoma, Wash., there was practically no change made in the personnel at Albany, and Mr. Brewer's headquarters remain in that city.

W. F. Raber, vice-president and general manager, San Diego Consolidated Gas & Electric Company, was a recent visitor to Los Angeles.

Charles Franke, vice-president of the Holophane Glass Company, New York, has been making an extensive visit to the Pacific Coast. He recently spent some time in San Francisco.

Thomas W. Carlson, Northwest sales representative for the Benjamin Electric Company, Seattle, Wash., attended the sales meetings of The Washington Electric Supply Company, Spokane, Jan. 12 and 13.

Clark Baker, of the National Mazda Lamp Works of the General Electric Company, Oakland, Calif., recently made a business trip to Chicago. While there he attended the conclave meeting of the Commercial Section of the N.E.L.A. as a representative of the lighting committee of the Pacific Coast.

H. H. Jones, vice-president and general manager of the Western States Gas & Electric Company, Stockton, Calif., made a brief stay in San Diego during January. Mr. Jones was formerly general manager of the San Diego Consolidated Gas & Electric Company.

William K. Vanderpoel, since 1916 general superintendent of distribution of what is now the electric department of the Public Service Electric & Gas Company, Newark, N. J., has resigned to become vice-president and executive engineer of the Okonite Company and the Okonite-Callender Company, Inc., manufacturers of wire and cable for electric purposes, with factories at Paterson and Passaic and general offices in New York City. Mr. Vanderpoel ranks high among the electric distribution engineers of the country.

R. E. Thatcher, superintendent of service, central district, Puget Sound Power & Light Company, Seattle; **Ellis Van Atta,** radio expert, Pacific Power & Light Company, Walla Walla, Wash.; **E. G. S. Pryor,** resident engineer, Underwriters' Laboratories, Inc., Seattle; **J. B. Downer,** city water department, Seattle; **C. H. Lum,** assistant general manager, National Board of Fire Underwriters of the Pacific; and **Roy C. Kenney,** of the Portland branch of NePage, McKenney & Company, Seattle, were among the prominent members of the industry in attendance at the first annual convention of the newly organized Northwest Association of Electrical Inspectors held in Portland, Jan. 11 and 12.

F. G. Marshall, of the Pacific Gas and Electric Company, San Francisco, lately attended the conclave meeting of the N.E.L.A. Commercial Section, representing **H. M. Crawford,** chairman of the Commercial Section, P.C.E.A.

James M. Evans, engineer, Board of Fire Underwriters of the Pacific, Los Angeles, was a recent business visitor to Santa Barbara.

M. J. Bendekovic, an assistant bookkeeper in the offices of the Public Service Company of Colorado, Denver, has won the Colorado National Guard's appointment to West Point. He is the third employee of the company in three years to win this honor.

A. E. Griswold, of the A. G. Manufacturing Company, Seattle, has been making an extended visit in California. He was recently in Los Angeles, accompanied by George Gray, his California distributor.

H. C. Hill, motor expert for the General Electric Company, recently addressed a large gathering of electrical engineers, contractors and dealers of San Diego, the guests of the San Diego chapter of the American Association of Engineers.

Ernest P. Kipp, Western district sales manager of the Hazard Manufacturing Company and vice-chairman of the Electric League of Colorado, Denver, attended a factory meeting at Wilkesbarre, Pa., a short time ago.

F. W. Carlson, representative of the Crouse-Hinds Company in Seattle, recently returned from a trip East, where he attended the meeting of the Association of Railway Electrical Engineers at Chicago. He also visited Syracuse where he spent some time going over new engineering developments, and paid a brief visit in San Francisco.

Lars Jorgenson, San Francisco engineer, who is the patentee of the constant-angle arch dam construction used in the concrete dam of the city of Tacoma's Cushman project, recently made an inspection of the dam. Mr. Jorgenson has been acting as consulting engineer during its erection.

W. C. Bryant, president of the Bryant Electric Company, Bridgeport, Conn., who has been making a tour of inspection of the company's Pacific Coast offices, attended the recent meeting of the Pacific Coast Electrical Supply Jobbers' Association at Del Monte, Calif., in company with H. B. Sanderson, district manager.

James S. Posgate, manager McLaughlin Glass Company, Los Angeles, was a recent San Francisco visitor.

W. A. Schoel, sales manager of the southern district of the Puget Sound Power and Light Company, Chehalis, Wash., was a recent speaker before the Chehalis Rotary Club. He briefly reviewed the development of power and light by electricity in this country since it was discovered to be economically possible some forty-five years ago.

H. W. Eales, chief electrical engineer, Union Electric Lght & Power Company, and **W. H. Sawyer,** president East St. Louis & Suburban Railway Company, both of St. Louis, sailed from San Francisco Feb. 2 for Australia. They have been appointed by the government of the State of Victoria ostensibly to "investigate and report on the Yailourn brown coal electricity-generation scheme and connected power undertakings of the Government Electricity Commission" but actually to give Australia the benefit of American experience in the development of power resources.

E. D. Stewart, branch manager of the Westinghouse Electric & Manufacturing Company at El Paso, Texas, was a recent visitor at the Los Angeles office of the company.

John F. Greenawalt, manager publicity department, the Mountain States Telephone & Telegraph Company, and district governor of the Kiwanis Club; **M. H. Soule,** manager, Western Public Service Company, Laramie, Wyo., and past president of the Laramie Kiwanis Club, were among the utility men who took an active interest in the recent district convention of the Kiwanis Club in Denver.

J. G. Jeffrey, director of publicity, Los Angeles Railway, accompanied by **Mr. Thomas,** secretary of the Los Angeles Advertising Club, visited San Francisco a short while ago in the course of a tour of all of the advertising clubs in California.

Claude W. Mitchell has been appointed chief electrical engineer of the Board of Fire Underwriters of the Pacific, as head of the electrical department which has been organized as a separate department. Mr. Mitchell has been associated with the Board as an electrical engineer for a number of years. He also is secretary of the California Association of Electrical Inspectors.

Fred E. Hazard, director of advertising and sales promotion for the Servel Corporation, on a recent visit to Denver announced the appointment of **Harold R. Smethills** as representative of the company in the Rocky Mountain district and the transfer of **William B. Milliken** to Salt Lake City as representative of the Intermountain district.

D. D. Sturgeon, A. E. Bacon, Clarence Keeler, B. J. Rowan and **Charles S. Newell** were the electrical men who served as judges in the recent Christmas lighting contest sponsored by the Electrical League of Colorado.

Thomas Alva Edison, famous electrical inventor, is 79 years old, having just had a birthday. He was born in Milan, Ohio, Feb. 11, 1847.

W. W. Briggs, vice-president and general manager, Grays Harbor Railway & Light Company, Aberdeen, Wash., spent some time in San Francisco a short while ago. Mr. Briggs formerly was district manager for the Westinghouse company and later general manager for the Great Western Power Company in that city.

Scott Z. Henderson, attorney of Tacoma, Wash., has resigned as director and special counsel for Stone & Webster, Inc., and joined the Tennent Steel Casting Company of Seattle, Tacoma and Vancouver, Wash., as vice-president, according to announcement by **M. G. Tennent,** president of the concern.

W. P. Weathers, chief electrical inspector, Longview, Wash.; **H. A. Patton,** electrical engineer, Washington Surveying and Rating Bureau, Seattle; **J. B. Fisken,** consulting engineer, The Washington Water Power Company, Spokane; **H. S. Jenkins,** chief electrical inspector, Bellingham; **Claude W. Mitchell,** chief electrical engineer, Board of Fire Underwriters of the Pacific; and **R. J. Larrabee,** engineer, Underwriters' Laboratories, Inc., San Francisco, were among those who took an active part in the organization of the Northwest Association of Electrical Inspectors at the convention in Portland Jan. 11-12.

S. L. Nicholson, formerly assistant to the vice-president, Westinghouse Electric & Manufacturing Company, East Pittsburgh, has been elected acting vice-president.

G. R. Scott, formerly district manager of sales in Chicago for the Jeffrey-Dewitt Insulator Company, has become connected with the Electric Service Supplies Company, Chicago. That company also recently added to its staff **C. V. Root,** who is to cover the Chicago territory in the interests of floodlighting.

L. M. Cargo, Rocky Mountain district manager of the Westinghouse Electric & Manufacturing Company, and a member of the advisory board of the Electrical League of Colorado, lately visited various California cities.

Clare N. Stannard, vice-president and general manager, the Public Service Company of Colorado, Denver, entertained the women employees of the Denver office at a luncheon Jan. 9. Plans of the women's organization were discussed with company officials and **Miss Inez Thompson,** a company employee who is chairman of the Women's Information Committee of the Rocky Mountain Division, N.E.L.A.

C. H. Gleason, of the accounting division of the Public Service Company of Colorado in Denver, has been transferred to the Kansas City Gas Company to take charge of the securities accounting department of the company in that district. Associates in Denver entertained at a farewell dinner in his honor at the Lakewood Country Club Jan. 8.

Leroy H. Crandall, formerly with the California Electrical Bureau, San Francisco, has been appointed northern California representative for Universal ranges by **C. J. E. Watson,** district manager of the Landers, Frary & Clark organization. The appointment became effective Feb. 1.

Emmett Ward, sales manager of the San Francisco district, Great Western Power Company of California, will succeed **H. E. Brillhart** as manager of the company's northwestern division, with headquarters at Napa. It was previously announced that **J. W. Anderson,** district sales manager for the company at Sacramento, would take Mr. Brillhart's place but, owing to illness, the above change has been made necessary. Mr. Anderson will continue in his position at Sacramento.

W. C. Sterne, retiring chairman of the Rocky Mountain Committee on Public Utility Information, Denver, was the guest of honor at a dinner at the Denver Club Jan. 23 arranged and attended by leading electrical and utility men of the Rocky Mountain region.

George A. Gray, of George A. Gray Company, manufacturers' agents of San Francisco, recently spent a week in southern California.

Herbert Cram, formerly with the Universal Electric Company, has joined the staff of the Edison Electric Appliance Company and probably will make his headquarters in Oakland.

W. G. Campbell, manager conduit department, Central Tube Company, Pittsburgh, recently made a tour of the Pacific Coast territory in the company of **H. F. Boardman** of Los Angeles, Pacific Coast representative of the company.

W. E. Creed, president, Pacific Gas and Electric Company, San Francisco, was one of the speakers at the second annual conference of the Allied Steel Industries held at Del Monte, Calif., late in January.

J. H. Lynch has been made manager of the New England merchandising division of the Westinghouse Electric & Manufacturing Company with headquarters in Boston. **John Andrews, Jr.,** formerly manager of the Cleveland branch office of the same company, has been named manager of the Detroit district office.

J. H. Mahler, formerly of the air brake engineering department of the General Electric Company, Erie, Pa., has joined the Electric Service Supplies Company, Philadelphia, as bus specialist.

Edward W. Weiler, for six years development engineer with the General Electric Company, recently has associated himself with the Eureka Tool and Machine Company, Newark, N. J., in charge of the mechanical and electrical specialty department.

Phil Gough of Listenwalter & Gough, Los Angeles, spent some time in San Francisco on business recently.

Frank N. Smith, formerly connected with the California Electrical Bureau, Los Angeles, has joined the exploitation department of Pathe Brothers.

H. E. Dralle, from the general engineering department of the East Pittsburgh plant of the Westinghouse Electric & Manufacturing Company, and **Thomas Fleming,** vice-president of the Oil Well Supply Company of Pittsburgh, were in Los Angeles for the American Petroleum convention, Jan. 19-22. **L. M. Cargo,** district manager for the Westinghouse Electric & Manufacturing Company in Denver, also attended the convention.

B. Y. Gibson, of San Francisco, Pacific Coast representative of the Walker & Pratt Manufacturing Company, Boston, recently was in Los Angeles in the interests of his firm.

George R. Randall, president and general manager of the Salt Lake Electric Supply Company, who was elected president of the Rocky Mountain Electrical Co-operative League, at Salt Lake City, for the year 1926, has been identified prominently with the electrical industry in that city for a numbear of years. He was born at Twin Creeks, Wyo., in 1887, and was educated in the grade schools and the University of Utah, Salt Lake City. He began his electrical career as a helper at the Murray, Utah, plant of the American Smelting & Refining Company in the spring of 1902. One year later he became employed as a helper

GEORGE R. RANDALL

with the Salt Lake Electric Supply Company, the institution which he now heads. During the next seven years he worked with several contracting concerns in Salt Lake City; and returned to the Salt Lake Electric Supply Company as a salesman in 1910. In February, 1914, he was made superintendent of construction. In March, 1916, the Salt Lake Electric Supply Company discontinued its retail merchandising and fixture business and confined its activities to construction work, and at that time Mr. Randall was appointed manager. In November, 1919, the business of this concern was purchased from the Capital Electric Company by Mr. Randall and Joseph L. Lawrence. Mr. Randall takes an active interest in anything that tends to promote the best interests of the electrical industry in the Intermountain section.

Obituary

J. G. Pomeroy, distributor for the Rome Wire Company in Los Angeles, died in that city Jan. 23. He had been a resident of Los Angeles since 1912, going there from Chicago where, for many years, he was sales manager for the Adams Bagnall Company. He was exceedingly active in the Electric Club of Los Angeles and was one of its first sergeants-at-arms.

George D. Squires, member of the California Railroad Commission, died in San Francisco Jan. 31 He was 71 years old.

TRADE NOTES

The Kurz-Kasch Company, Dayton, Ohio, has placed on the market a group control for radio sets providing a master control and at the same time a correcting vernier for each of the tuning units. The equipment is adapted for use in rebuilding old sets or for building new sets with the master-control feature. The equipment is being placed on the market in kits, including all necessary parts for changing over an ordinary three-dial radio frequency set to a master-control tuning. The advantages claimed for the new control apparatus include simultaneous control by the master dial, vernier tuning for each of the units, and easy location of stations by use of master control and connection of verniers.

Celite Products Company has moved its San Francisco offices to 140 Spear Street, that city.

The Diamond Power Specialty Corporation, Detroit, has appointed **M. J. Miller** as sales engineer in charge of the Detroit district.

The Selector Company, 2005 Sixth Avenue, Seattle, is the name of a new manufacturer in that city making a loud speaker. **Stephen J. Linden** is president, and **J. H. McLennan,** formerly Pacific Coast representative of Electrical Record, is general sales manager.

Peerless Insulated Wire & Cable Company, New York, has issued recently an elaborate descriptive bulletin containing sixteen full-page illustrations and a brief outline of the process of manufacturing cotton-clad weatherproof wire and cable.

Harry Ford Electric Store, 6808 Putnam Avenue, Culver City, Calif., is a new addition to the business district there. Mr. Ford formerly was associated with Fred Jarvis Electric Company of that city and is well known in the community. He will do electrical contracting as well as radio and electrical merchandising.

The Globe Electric Company, formerly located in the Bay Builders Exchange Building, Santa Monica, Calif., and operated by D. E. Baird, has moved into the Wilshire Electric Store at 1030 Wilshire Boulevard, Santa Monica. The latter stock has been purchased by Mr. Baird, who is conducting business under his old firm name of Globe Electric Company.

The Robbins & Myers Company, Springfield, Ohio, has issued two large fan catalogs under Nos. 1265 and 1271. The former gives a complete description with illustrations of its line of electric fans for a.c. and d.c. circuits, non-oscillating, oscillating, ceiling and ventilating fans. Complete price lists also are included in the catalog. The other catalog embodies dealer helps and selling opportunities and contains samples of the various kinds of literature on fans published by the company.

J. H. Bunnell & Company, New York City, manufacturers of high-grade telegraph apparatus, fire-alarm apparatus and other electrical equipment, has been acquired by J. J. Raftery and J. G. Dougherty. Mr. Raftery has been elected president of the company, while Mr. Dougherty will become vice-president and treasurer.

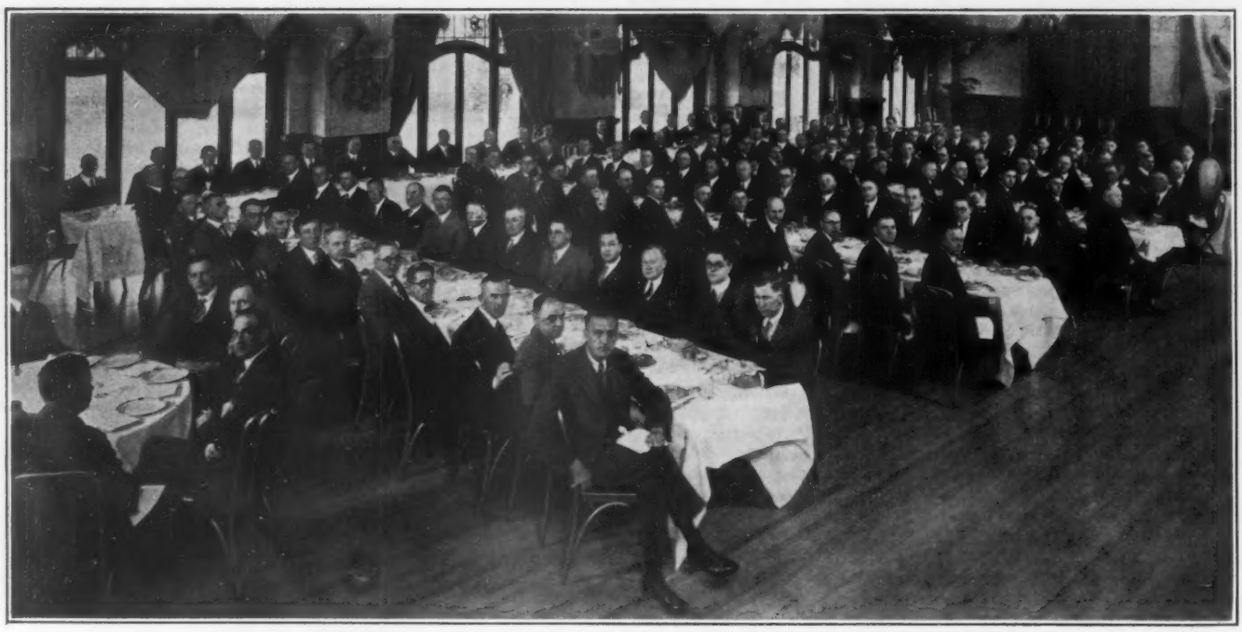
The Sunset Electric Company, Seattle, plans immediate construction of a new factory on Eleventh Avenue and Pine Street to cost $60,000. The structure will be one-story and basement, ordinary masonry construction, 120 x 120 ft. in size. The firm now is located at 1509 Broadway.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a publication describing its type CL carbon circuit breakers, which are claimed to be of particular interest to builders and architects. This type of breaker, designed especially for 250-volt industrial application where a compact breaker is required, is described fully in this circular under No. 1705-A. The pamphlet is well illustrated and outlines the important characteristics of the breaker, including effective shock absorption, adjustment and equalization of brush pressure and use of overload attachments.

Groundulet Company, Newark, N. J., has moved into its new quarters at 480 Broad Street, that city.

General Electric Company, Schenectady, N. Y., has introduced two new types of portable curve drawing instruments, the CP-4 and the CP-5. These instruments are intended for alternating current work, the first being equipped with a Chelsea clock paper drive and the second with a Warren motor. With them chart speeds of one, three, six or twelve inches per hour may be obtained, and all instruments are equipped with a gear shift which changes from inches per hour to inches per minute, or vice versa, on either clock or motor-driven charts.

P. E. Chapman Electrical Works, St. Louis, Mo., have placed on the market an electromagnetic seed cake stripper head which they claim eliminates damage to press cloth and at the same time provides safety for the operator. The machine is described and illustrated in the folder recently issued by the company.



Deep problems of physics confront these gentlemen. They are none other than the Technical Section, P.C.E.A., at their recent conclave in San Francisco. Table 1 from the left is making a study of which fork to use on the salad. Table 2 is deeply concerned over the inductive interference encountered when trying to eat peas with a knife. Table 3 is more interested in safety practices and is watching to see what the head table does with its elbows in crowded quarters. Table 4 considers the question of writing a paper on "Metered Meat, or What Price Gory." And the last table, being prime movers, are moved to prime or primed to move, it will never be known which.